ARITHMETIC WITHOUT A PENCIL

E. M. JOY

D·C·HEATH & CO. BOSTON

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Desk Copy.

ARITHMETIC

WITHOUT A PENCIL

BY

EDITH M. JOY

> And to know,
> Rather consists in opening out a way
> Whence the imprisoned splendor may escape,
> Than in effecting entry for a light
> Supposed to be without.
>
> — BROWNING

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1905

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FOREWORD

THE superiority that is claimed for this book is based upon its logical, easily progressive, purposeful arrangement: logical, because each new principle or fact is introduced at the point at which the need for it appears; easily progressive, because but one difficulty at a time is presented and its mastery leaves the student with the power necessary to the accomplishment of the next; purposeful, because each exercise carries with it a particular something to be achieved, bearing directly upon the perfect whole.

Teachers of Arithmetic must bear in mind that each new phase of the science should be developed without the pencil in the student's hand; that Written Arithmetic is logically supplementary to Mental Arithmetic; and that all work must be systematic, living, and full of purpose.

Let the aim be clear reasoning, accuracy, and rapidity; with steady, daily gain in each; and let success mean, not so much the acquirement of knowledge of certain facts and principles, as the development of the power that is within.

EDITH M. JOY.

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TO THE TEACHER

An arithmetical thought should be developed by means of (1) concrete problems involving easy numbers; after this should come (2) abstract drill until the pupils become so skillful that in further reasoning they are unhampered by the numbers; following a full comprehension of the thought, (3) problems should be given whose solution requires use of the pencil.

Abridged illustrations:

First. I spent 10 cents, which was $\frac{2}{3}$ of my money. How much money had I?

Second. 25 is $\frac{5}{8}$ of what number?

Third. My father sold a cow for \$60, which was $\frac{6}{7}$ of the cost. What did he pay for her?

Fourth. A store was sold for \$250,200. This was $\frac{9}{11}$ of what was asked for it. What was asked?

Each new principle must be dwelt upon long enough to insure its becoming fixed in mind. To do this it will be necessary for pupils to solve, without pencil, many more problems than are contained in this book. These problems he may make for himself largely. Illustrations: Make ten problems involving the principle of No. 20, Exercise 193, and introducing as much variety as possible. Make practical examples using the numbers in No. 16, Exercise 201.

The class must be studied. Its needs will furnish the inspiration from which will grow the plan for the daily lesson. May "Arithmetic without a Pencil" justify its existence by proving to be of assistance in the carrying out of such plans.

E. M. J.

ARITHMETIC WITHOUT A PENCIL

ADDITION

1

6	8	5	3	4	9	7	6	4	6	5	7
7	4	9	7	6	8	8	3	7	6	6	7
8	2	7	8	7	5	4	4	9	6	7	4
5	9	2	8	9	4	3	9	9	8	5	4

2

16	18	15	13	14	19	17	16	14
7	4	9	7	6	8	8	3	7
16	14	15	16	18	12	17	17	17
5	4	7	6	5	6	7	2	9
15	14	14	19	17	14	19	17	16
4	3	9	9	6	8	5	3	4
18	18	13	17	15	17	15	16	12
9	7	6	4	6	5	8	8	7
19	14	13	19	18	18	13	19	18
7	5	4	6	6	2	9	2	3
18	16	14	17	17	18	13	12	19
8	9	7	9	6	5	8	9	3

3

9+9	4+9	4+3	5+4	6+5	4+4	5+7
6+6	5+8	6+2	7+7	2+7	7+9	4+7
3+6	8+7	9+8	6+4	7+3	9+5	4+8
6+7	3+5	8+3	2+9	5+4	6+3	4+2

4

19+ 9	14+ 9	14+ 3	15+4	16+5	14+4	5+17
6+16	5+18	6+12	17+7	12+7	17+9	4+17
3+16	8+17	19+ 8	16+4	17+3	19+5	4+18
6+17	3+15	18+ 3	13+3	12+9	15+4	16+ 3

5

3	6	6	3	2	4	6	5	4	4	4	8	3
4	3	3	8	3	9	4	9	7	8	7	2	8
6	5	7	2	6	4	9	2	5	4	2	1	5
7	3	3	5	3	7	9	4	4	2	3	8	9
3	4	9	7	4	7	7	6	5	7	8	8	7
8	7	2	5	9	2	3	5	8	6	7	7	4
5	7	5	4	9	5	3	6	3	4	6	4	7
6	7	3	7	7	2	9	8	2	2	2	2	8
8	4	9	6	8	7	3	7	6	6	5	5	9

5	9	4	5	2	7	4	6	8	3	6	4
9	8	7	7	6	9	9	8	4	7	7	6
7	3	6	5	2	7	2	5	4	4	9	6
8	6	5	8	6	7	7	4	3	9	9	4

7	2	3	5	8	7	4	3	9	6	3	4	8	7	4	6
9	8	7	9	3	8	9	9	9	6	5	4	5	6	7	3
6	7	4	9	3	7	7	2	5	5	7	9	2	3	4	5

6

3+7+8	7+2+5	7+3+5	6+2+7	4+4+4
8+2+7	1+9+6	7+6+4	7+1+4	6+6+6
5+5+3	3+4+6	8+1+2	4+3+5	9+1+8
6+4+6	5+2+8	7+2+7	6+1+7	6+8+4
9+8+2	4+5+3	8+1+9	2+5+6	3+3+7
4+9+1	6+3+2	5+3+7	3+3+3	4+4+6
8+6+4	5+3+5	4+4+8	5+5+5	7+7+2

7

10	10	10	10	10	10	10	10	20
6	8	7	2	5	4	9	3	2
20	20	20	30	30	30	30	10	10
7	9	6	8	4	3	5	18	17
10	10	10	10	10	10	10	10	20
11	12	13	15	14	19	16	20	14
20	20	30	30	30	30	30	30	30
17	13	12	15	13	16	19	14	18
30	40	40	40	40	40	50	60	70
17	17	19	16	14	17	18	17	19

8

12	11	17	11	13	14	15	15	15	18
13	14	12	11	13	13	14	11	15	11
14	15	14	11	11	13	12	12	17	11
14	12	12	12	16	11	12	16	13	17
13	13	13	13	18	14	15	19	15	16
15	16	14	19	12	18	16	11	17	11

9

20	20	20	20	20	20	80	50	30	30
10	50	30	60	20	40	20	30	30	40
50	60	40	40	50	60	70	90	95	75
30	30	40	50	50	40	30	10	5	25
75	50	25	85	70	30	20	40	85	85
15	25	25	15	30	50	80	50	5	15

10

26	28	25	23	24	29	27	26	24	26
7	4	9	7	6	8	8	3	7	5
24	25	26	28	22	27	27	27	24	24
4	7	6	5	6	7	2	9	3	9
29	25	27	28	23	27	29	29	28	27
9	8	8	5	8	6	5	7	8	7

11

17+13	14+12	11+11	13+13	11+12	14+13
11+16	11+14	14+14	16+14	17+12	15+12
19+11	15+14	12+18	18+11	12+13	15+15
15+11	12+12	13+11	18+8	19+7	18+5

12

22+6	27+9	26+3	24+4	28+5	26+7
23+7	24+3	24+7	25+7	27+8	28+4
27+7	24+6	27+2	24+9	26+5	26+6
29+8	25+9	29+8	27+4	28+7	29+6

13

39	37	36	38	35	48	42	47	44	47
4	8	5	4	9	5	9	6	9	4
55	56	54	58	53	61	68	63	65	69
7	8	5	9	8	8	8	9	6	9

14

71+9	77+8	75+7	73+8	79+5	76+8
84+5	85+6	81+9	89+7	88+5	86+3
95+9	97+6	98+6	93+8	96+5	92+9

15

1	2	3	4	5	6	7	8	9	6	3	9	7	8	3	5
2	3	4	5	6	7	8	9	1	4	8	5	2	7	8	6
3	4	5	6	7	8	9	1	2	2	7	4	7	8	3	5
4	5	6	7	8	9	1	2	3	3	2	3	5	7	8	6

16

20	80	90	70	20	50	90	60	30	90
30	50	40	20	10	60	10	40	80	50
60	10	10	50	80	10	20	20	70	40
90	30	60	30	70	40	30	30	20	30
80	30	60	70	30	90	70	90	70	50
70	80	60	50	30	50	30	50	70	30
80	30	60	50	40	60	90	40	40	30
70	80	60	70	40	40	40	50	40	50

17

48	29	18	25	59	34	29	57	16	35
32	42	44	37	16	15	19	38	19	16
17	16	51	12	18	17	25	19	48	41
24	19	9	27	49	25	18	30	27	13

18

17	19	18	51	18	19	18	13	19	11
16	11	14	17	17	17	15	15	19	12
13	15	12	14	18	13	15	15	17	13
17	18	19	12	19	15	14	17	18	14
19	11	17	18	16	14	11	12	12	15
18	13	11	19	19	12	19	18	13	16
16	17	15	16	15	10	12	11	19	17

19

249	276	349	473	209	411	246	479
372	298	726	484	483	789	279	358
297	723	138	567	289	195	444	137
653	417	239	843	476	235	115	237
425	215	507	727	239	317	238	105

20

Complements of 10

8	6	1	7	4	9	5	2	3	7	5
2	4	3	8	6	1	9	4	9	5	1
7	3	8	6	2	1	6	8	7	5	4
2	3	9	5	8	9	2	1	6	3	7
4	6	7	9	3	5	7	6	8	4	2

Complements of 12

2	9	3	5	4	6	8	7	1
11	10	8	2	1	11	9	6	3
7	4	9	5	10	2	1	8	11
9	7	6	4	8	3	5	10	2

Complements of 20

18	12	5	3	9	6	4	2	7
10	11	7	1	8	13	9	17	5
13	15	6	14	7	19	3	9	2
16	9	11	7	13	2	15	4	7
8	6	4	14	6	11	3	8	9

21

Complements of 25

20	10	15	24	12	18
11	7	9	21	17	23
13	22	16	19	5	3
14	9	13	2	7	16
12	8	3	5	19	17
5	24	12	23	3	22
3	19	8	18	12	14

22

Complements of 50

10	40	20	30	45	5
25	35	15	49	39	9
29	11	21	41	31	1
44	34	14	24	16	4
26	36	46	47	37	7
27	17	48	38	28	8
18	43	33	23	13	3
42	32	32	12	25	2

23

Complements of 100

50	75	25	90	10	80	20	40	60	30
70	95	85	75	65	5	15	25	35	45

24

Complements of 100

85	87	88	84	86	81	82	89	88	13
15	19	12	18	11	14	17	18	79	75
71	77	73	74	76	72	78	25	27	29
21	24	26	23	28	22	71	85	19	27

25

Complements of 100

69	61	65	67	63	68	62	66	64	35
36	34	31	39	38	32	33	37	55	56
54	53	57	58	52	51	59	41	49	48
42	43	47	46	44	45	35	47	63	51

26

Add:

75	50	95	15	76	99	96	71	18	83
25	12	5	85	24	10	4	20	82	17
9	50	3	12	15	1	5	29	25	30
39	45	84	27	49	63	55	82	68	19
61	55	60	73	51	37	5	18	32	49
4	50	16	19	25	9	45	17	15	51

27

Add:

19	13	23	35	75	80	40	60	50	65
65	73	86	49	11	48	21	84	17	65
35	27	14	51	81	52	79	16	83	35
35	95	29	45	31	28	49	88	29	52
66	9	29	45	31	28	49	88	29	18
34	91	71	55	69	72	51	12	71	48

28

Add:

45	29	56	95	18	24	58	47	27	19
27	71	44	7	82	25	42	53	73	81
73	14	13	5	15	75	5	9	25	11
5	6	9	4	2	5	40	50	5	11
75	32	85	65	78	63	42	23	75	65
25	68	15	35	22	37	58	77	25	35
25	15	10	20	10	10	20	50	60	77
25	10	15	5	10	9	30	50	40	23

29

Complements of 1000

500	900	100	200	800	700	300	400	600
750	250	350	650	750	450	150	850	950
50	990	10	20	980	970	30	40	960
920	930	960	940	910	80	60	70	970

30

Complements of 1000

850	880	860	840	870	890	40	120	150
140	160	130	170	190	200	790	710	720
780	770	730	740	760	750	230	240	260
270	280	220	210	290	390	310	320	380
370	330	340	360	620	680	670	630	640
660	650	610	690	689	753	492	617	499

31

6	7	8	9	12	6	7	8	9	12
6	7	8	9	12	6	7	8	9	12
6	7	8	9	12	6	7	8	9	12
6	7	8	9	12	6	7	8	9	12
6	7	8	9	12	6	7	8	9	12
6	7	8	9	12	6	7	8	9	12
					6	7	8	9	12

36	42	48	54	72	42	49	56	63	84
6	7	8	9	12	6	7	8	9	12

32

6	7	8	9	12	6	7	8	9	12
6	7	8	9	12	6	7	8	9	12
6	7	8	9	12	6	7	8	9	12
6	7	8	9	12	6	7	8	9	12
6	7	8	9	12	6	7	8	9	12
6	7	8	9	12	6	7	8	9	12
6	7	8	9	12	6	7	8	9	12
6	7	8	9	12	6	7	8	9	12
					6	7	8	9	12

48	56	64	72	96	54	63	72	81	108
6	7	8	9	12	6	7	8	9	12

36+ 6	42+ 6	48+ 6	54+ 6	60+ 6
42+ 7	49+ 7	56+ 7	63+ 7	70+ 7
48+ 8	56+ 8	64+ 8	72+ 8	80+ 8
54+ 9	63+ 9	72+ 9	81+ 9	90+ 9
72+12	84+12	96+12	108+12	120+12

33

60	66	70	80	88	90	99	99	110	121
6	6	7	8	8	9	9	11	11	11
120	132	11	12	11	12	9	8	11	
12	12	121	120	99	132	99	88	121	

34

6	7	9	5	4	9	8	9	8	9	7
6	7	8	5	9	9	6	8	7	9	7
6	7	8	5	4	9	6	9	7	9	7
6	7	8	5	4	9	6	9	7	11	3
6	9	8	5	4	9	6	9	7	11	3
6	7	8	5	4	7	6	9	7	11	3
9	7	8	8	4	9	6	9	7		
6	8	5	9	8		6	8	9	5	6
6	8	5	6	8	5	9	8	9	5	7
6	8	9	9	12	7	7	8	9	5	6
6	8	9	6	8	5	9	8	8	5	7
12	9	9	9	12	7	7	8	9	5	6
12	9	9	6	12	5	9	8	9	5	7
						9	9		6	6
7	8	9	6	8	7	9	5	8	9	6
6	9	8	9	6	8	6	9	7	3	9
7	8	9	6	9	8	6	8	8	6	6
6	9	8	9	7	7	9	7	6	5	7
7	8	9	6	9	8	7	6	8	4	6
6	9	8	9	7	8	8	6	5	8	8
7	8	9	6	6	7	7	8	8	9	7

35

7+1+8+9	8+1+6+7	6+2+3+5	9+1+9+7
6+1+7+8	1+5+6+9	7+7+3+8	7+2+9+6
8+3+4+7	4+8+7+5	9+3+6+6	6+7+5+8
9+4+7+6	7+7+6+8	6+8+9+4	9+4+7+7
7+8+9+6	9+6+7+8	9+7+5+4	3+7+8+3

4+6+5+5+9+7	6+6+9+3+3+7	7+3+7+8+6+9
7+8+7+8+6+9	6+8+6+4+6+9	10+4+6+4+5+5
7+7+7+7+7+3	8+3+7+6+5+9	3+4+7+9+5+2

2+5+3+4+1+7+9+8	5+3+4+9+1+8+7+2
2+3+1+9+8+7+4+5	9+4+2+7+6+5+3+8
2+7+6+5+9+4+8+3	3+8+5+6+4+9+2+7
9+7+7+6+8+8+5+8	4+8+5+9+7+3+9+8

36

Add horizontally:

7, 2, 4, 3	4, 9, 6, 2	4, 3, 7, 6, 7, 8, 9
8, 3, 7, 4	9, 3, 5, 7	5, 7, 2, 8, 3, 6, 4
5, 7, 9, 3	6, 9, 8, 7	6, 9, 4, 7, 7, 9, 5
4, 2, 5, 6	3, 7, 9, 8	3, 8, 8, 7, 6, 5, 9
7, 6, 4, 8	7, 6, 8, 8	9, 7, 1, 3, 2, 5, 8

17, 9, 11, 15	25, 13, 17, 9	13, 17, 9, 8	15, 25, 15, 9
12, 13, 7, 6	17, 27, 4, 10	11, 12, 12, 15	75, 50, 45, 12
4, 19, 2, 15	12, 9, 38, 14	18, 9, 13, 15	37, 20, 17, 5
16, 17, 11, 8	29, 8, 14, 42	20, 12, 15, 7	14, 15, 16, 17
14, 15, 9, 12	11, 17, 18, 47	19, 19, 16, 18	9, 7, 18, 3

287, 439	726, 822	473, 728	219, 371	583, 584
275, 986	496, 117	284, 256	529, 318	728, 472
335, 481	914, 211	495, 205	417, 482	416, 728
253, 115	611, 213	129, 482	209, 314	598, 498

37

COUNTING

1. By 2's from 50 to 100 and back.
2. By 2's from 1 to 51 and back.
3. By 2's from 51 to 99 and back.
4. By 5's from 0 to 100 and back.
5. By 10's from 1 to 121 and back.
6. By 10's from 0 to 120 and back.
7. By 10's from 2 to 132 and back.
8. By 11's from 0 to 132 and back.
9. By 12's from 0 to 144 and back.
10. By 12's from 144 to 240 and back.
11. By 3's from 0 to 52 and back.
12. By 3's from 1 to 53 and back.
13. By 3's from 2 to 54 and back.
14. By 4's from 0 to 100 and back.
15. By 4's from 1 to 101 and back.
16. By 4's from 2 to 102 and back.
17. By 4's from 3 to 103 and back.
18. By 6's from 0 to 102 and back.
19. By 25's from 0 to 500 and back.
20. By 15's from 0 to 150 and back.
21. By 7's from 0 to 91 and back.
22. By 8's from 0 to 104 and back.

SUBTRACTION

38

15	18	16	13	17	12	14	11	19	15
10	10	10	10	10	10	10	10	10	9
18	16	13	17	12	14	11	19	25	28
9	9	9	9	9	9	9	9	10	10
26	23	27	22	24	21	29	25	28	26
10	10	10	10	10	10	10	9	9	9
23	27	22	24	21	29	25	28	26	23
9	9	9	9	9	9	19	19	19	19
27	22	24	21	29	29	28	27	26	23
19	19	19	19	19	8	7	5	5	8

39

37	37	37	37	35	35	35	35	48	48
10	9	19	29	10	9	19	29	10	9
48	48	48	51	51	51	51	51	51	62
19	29	39	10	9	19	29	39	49	10
62	72	82	92	73	73	73	73	73	53
9	9	19	19	10	9	19	29	39	29
43	63	93	91	92	83	61	42	52	63
39	59	79	9	19	9	19	9	19	49

40

11−2	21−2	31−2	41−2	51−2	61−2	71−2
81−2	91−2	101−2	11−3	31−3	51−3	71−3
81−3	91−3	21−3	41−3	61−3	101−3	12−3
22−3	52−3	62−3	82−3	42−3	72−3	92−3

41

21	31	41	51	61	71	81	91	61
12	12	12	12	22	22	22	22	32
61	61	71	21	31	41	51	61	71
42	52	32	13	13	13	13	23	33
61	81	91	91	101	101	22	42	52
33	33	13	33	63	53	13	13	13
72	92	102	102	102	82	62	72	53
13	13	13	23	33	43	33	43	23

42

40	40	40	40	40	40	40	40	40	40
9	1	2	3	13	22	19	11	12	13
40	40	40	31	31	31	31	31	31	31
23	32	13	9	2	3	13	23	12	9
52	52	52	52	52	52	40	31	51	30
9	3	13	23	33	43	14	22	9	13

43

10	11	12	13	18	19	20	21	22	23
4	4	4	4	4	4	4	4	4	4
28	29	20	21	22	23	28	29	40	51
4	4	14	14	14	14	14	14	24	24
72	63	97	98	27	31	52	66	86	36
24	34	54	84	14	14	24	34	44	14

44

10 − 5	80 − 55	22 − 15	63 − 35	84 − 55	74 − 45
20 − 5	90 − 45	32 − 25	73 − 35	85 − 55	72 − 35
30 − 5	90 − 55	42 − 15	73 − 25	75 − 55	60 − 15
40 − 5	11 − 5	52 − 45	93 − 5	105 − 55	60 − 35
50 − 5	21 − 5	62 − 35	83 − 15	76 − 15	49 − 35
20 − 15	21 − 15	72 − 35	14 − 5	87 − 35	65 − 35
30 − 15	31 − 5	82 − 15	24 − 15	48 − 25	91 − 85
40 − 15	31 − 15	92 − 65	34 − 5	59 − 15	47 − 15
50 − 15	31 − 25	13 − 5	44 − 25	66 − 25	56 − 25
50 − 25	41 − 5	23 − 5	54 − 45	69 − 55	81 − 55
60 − 25	41 − 15	52 − 25	64 − 25	39 − 25	72 − 25
70 − 25	41 − 25	53 − 25	74 − 35	98 − 35	63 − 15
70 − 35	12 − 5	33 − 15	94 − 15	91 − 35	64 − 45
80 − 45	22 − 5	63 − 25	94 − 85	93 − 35	51 − 25

45

10	10	11	11	12	13	13	14	14	15
6	4	6	5	6	6	7	6	8	6
15	25	35	45	25	35	45	24	34	44
9	6	16	16	16	16	16	6	6	6

54	64	64	64	13	23	23	33	33	43
6	16	26	36	6	6	16	16	26	26
53	43	11	21	41	71	61	81	12	22
26	16	6	6	6	6	16	56	6	6
22	32	42	66	46	56	27	37	97	87
16	26	16	6	16	36	26	16	56	36
88	98	49	59	69	79	39	80	71	52
66	6	6	16	36	26	36	46	36	26
53	74	85	100	23	35	51	52	35	94
16	56	55	6	6	6	36	16	16	76

46

9	8	19	18	16	15	14	13	12	11
7	7	7	7	7	7	7	7	7	7
10	20	21	21	22	22	23	33	33	43
7	7	7	17	17	7	7	7	17	17
43	53	63	63	41	41	51	31	32	42
27	27	27	37	7	17	7	17	17	7
52	92	30	30	40	50	54	54	24	34
27	67	7	17	17	27	27	7	7	17
35	35	35	45	45	25	35	36	26	46
17	27	7	7	17	17	17	17	17	7
46	56	56	36	37	47	17	17	27	37
37	37	7	17	17	27	8	9	19	18
47	47	57	100	100	100	100	100	100	51
28	29	29	37	67	17	47	87	27	17

47

9	19	18	17	16	15	14	13	12	11
8	8	8	8	8	8	8	8	8	8
11	15	13	20	17	27	27	26	25	21
3	7	5	8	9	9	8	8	8	8

16 – 8	13 – 8	14 – 8	10 – 8	12 – 8	15 – 8
11 – 8	17 – 8	15 – 8	13 – 8	11 – 8	12 – 8

48

90	70	60	50	30	80	41	21	91	71
78	58	48	28	18	38	18	18	68	28
51	31	52	62	22	82	72	52	33	43
28	18	28	18	18	58	38	48	8	28
53	23	63	83	64	74	44	54	55	35
18	18	38	18	58	38	28	18	18	18
65	75	45	46	66	66	96	17	37	87
28	68	28	28	28	58	78	8	8	18
67	27	42	39	21	73	60	40	70	95
38	18	8	8	8	8	8	8	8	8

The number from which another number is taken is called the min′-u-end. The number taken away is the sub-tra-hend. The answer is the re-main-der. It is also called the dif-fer-ence.

49

Use 100 for minuend and the following numbers for subtrahend:

75	86	74	73	77	78	72	71	79	45
36	54	83	27	88	92	61	49	65	26
34	43	57	68	12	81	89	48	35	86
94	23	37	48	32	41	19	55	16	24
63	47	38	52	21	59	28	36	14	25

50

Find missing number and tell whether it is minuend or subtrahend:

17	16	25	33	39	27	25	42	36	53
9	9	8	8	17	8	17	23	15	19
21	17	25	33	32	45	100	100	100	100
12	9	17	18	16	20	85	76	23	45
100	100	73	49	63	47	69	41	39	75
16	27	8	15	29	17	5	12	29	25

51

Missing number and give its name:

?									
17	18	15	19	17	16	25	25	50	25
9	8	12	9	18	24	50	100	25	17
?									
17	16	29	16	49	72	63	20	40	85
18	29	17	15	49	18	64	71	60	15

52

49	52			25	38		82	45	
27		17	57		28	75			19
38		65	42	32		13	12	40	56

39									
12	12	14	37	29	38	16	44	19	30
39		14	37	51	48	19	56	25	31

53

CONCRETE EXAMPLES. ADDITION AND SUBTRACTION

1. How many dollars have John, Ray, and Field if each one has $7? $8? $9? $12?

2. How many oranges have these boys? Charlie has 8, James has 18, and Ray has 10.

3. Harry has $49 and Herbert has $11 more. How much has Herbert?

4. It is 33 miles from Pomona to Los Angeles, and 18 miles farther to the ocean. How far from Pomona to the ocean?

5. Max rode 15 miles on Monday, 12 miles on Tuesday, and 9 miles on Wednesday. How far did he ride during the three days?

6. Julia paid 8 cents for a copy book, 5 cents for a note book, and 25 cents for a music reader. What did she pay for all?

7. How many eggs in one dozen and 11 eggs? In one dozen and nine?

8. There are 14 pupils in the A class and 19 in the B class. How many in both?

9. Walter put 65 cents in the bank last week and 34 cents this week. How much did he deposit in both weeks?

10. Oscar weighs 49 pounds and Martin weighs 19 pounds heavier. How much does Martin weigh? What is the weight of both?

11. Mary is 11 years old. Her brother is 37. How much older is he?

12. It is 33 miles from Pomona to Los Angeles, and 18 miles from Los Angeles to Santa Monica. How much farther from Los Angeles to Pomona than to Santa Monica?

13. Laura is 15 years old. Her mother is 49. How much younger is Laura than her mother? How old was her mother when Laura was born?

14. Fannie's standing in spelling was 89 and Tom's 98. What was the difference between them?

15. How far apart are two places that are 100 miles and 75 miles re-spec-tive-ly in the same direction from another place?

16. One boy has 97 pigeons; another has 59. How many have both? How many more has one than the other?

17. There were 75 trees in a certain grove. How many were left after 19 were cut down?

18. How much higher is oil at 90 cents a can than at 58 cents?

19. It cost my father $84 to paint our house this year. Two years ago it cost him $108. How much more was that?

20. It is 95 rods around a certain field and 47 rods around another. How much farther around the first than around the second?

21. If Thomas earns 10 cents on Monday, 15 cents on Tuesday, and 20 cents on Friday, how many cents does he earn in the three days?

22. If Carrie gathers 7 eggs on Wednesday, 8 on Thursday, and 12 on Friday, how many does she gather in the three days?

23. A man travelled 12 miles on one day, 15 miles on the next day, and 9 miles on the next day. How far did he travel in the three days?

24. Robert gives 25 minutes to arithmetic, 20 minutes to spelling, and 30 minutes to reading. How many minutes does he give the three lessons?

25. A farmer has 15 orange trees, 12 lemon trees, 9 peach trees, and 11 pear trees. How many trees in all?

54

1. From A to C is 12 miles. From A to B is 50 miles. How far from C to B?

2. From A to B is 51 miles. From A to D is 39 miles. How far from D to B?

3. From A to C is 25 miles; to D is 12 miles farther. It is 100 miles from A to B. How far from D to B?

4. From C to D is 15 miles; from D to A is 38 miles. What is the distance from A to C?

5. A and B are 75 miles apart; A and C 18; and C and D 27. How far apart are D and B?

55

B to A is 20 feet. A to C is 30 feet.

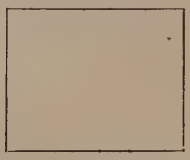
1. Az is 5 feet. How long is Bz? Cz?
2. Ax is 9 feet. How long is xz? Bx? Cx?
3. Ay is 7 feet. How long is zy? xy? By? Cy?
4. Which is longer, xz or Ay? Cx or By?

56

1. How far apart are two boys who have ridden 26 miles and 34 miles in opposite directions from the same place?
2. Two towns are 63 miles and 48 miles respectively north of San Francisco. How far apart are they?
3. Ned lives 17 blocks east of the schoolhouse and George 18 blocks west. How far from Ned's home to George's?
4. One ship has sailed 100 miles and another 83 miles in the same direction. How far apart are they?
5. The depot is 48 blocks from our house. The post-office is 29 blocks from our house in the same direction. How far apart are the depot and the post-office?

57

Find how far around:



1. Room 10 feet wide and 15 feet long.
2. Lot 50 feet in width, 112 feet in depth.
3. Field 70 rods wide and 95 rods long.
4. Farm 140 rods wide, 300 rods long.
5. How far around a room 15 ft. wide and 18 ft. long?
6. How far around a room $17\frac{1}{2}$ ft. wide and 20 ft. long?

58

1. May had $1 in the bank. She drew out 45 cents. How much had she still in bank?

2. Monroe has 75 cents and he is going to earn enough to make $1. How much must he earn?

3. I bought goods to the amount of 69 cents. I gave a half and a quarter of a dollar in payment. What change should I receive?

4. The *Chronicle* costs 65 cents a month. If I give the collector $1, what change should he give me?

5. My dinner at the restaurant cost 35 cents. What change should be given me if I give a dollar in payment?

6. A boy had 35 rabbits and sold 15. How many had he left?

7. Charles had 120 feet of twine for his kite and lost 19 feet. How much had he left?

8. A farmer had 30 acres of meadow land and sold 15 acres. How many acres had he left?

9. May is reading a book containing 48 pages. She has read 20 pages. How many remain to be read?

10. There are 30 days in June. How many days are left after the 11th?

11. There are 31 days in December. How many days after Christmas?

12. Max had 5 dozen eggs. He sold 26. How many had he left?

13. Raymond had $50 in the bank. He drew out $19. How much had he left?

14. If I sleep 9 hours out of the — hours in a day, how many hours are left for work and play?

15. A girl missed 7 words out of 60. How many did she spell correctly?

16. How many years before an eight-year-old boy will be 21?

17. Carrol put $17 in the bank last month and before he did so he had $25 there. How much has he there now if he has not drawn any out?

18. August has $37 in the bank and Conrad has $50. How much more has Conrad than August?

19. James spent 20 cents for stamps, 15 cents for pens, and 25 cents for paper. How much did he spend in all?

20. Fred had one dollar. He spent 87 cents. How much had he left?

59

1. Frank and Arthur own 25 acres of land each. How much less than 100 acres does each own? Do both?

2. $100 - (25 + 25) = ?$ $100 - 25 - 25 = ?$

3. From a kite string 48 yards long, 15 yards were lost at one time and 13 yards at another time. How many yards remained?

4. $48 - 15 - 13 = ?$ $48 - (15 + 13) = ?$

5. Roy had $100 in the bank. He drew out at different times, $10, $15, and $9. How much was left?

6. $100 - (10 + 15 + 9) = ?$ $100 - 10 - 15 - 9 = ?$

7. A man had 75 tons of hay. He sold 45 tons and then bought 17 tons more. How many tons had he then?

8. $75 - 45 + 17 = ?$ $(75 - 45) + 17 = ?$

9. Mr. Day had 19 horses and bought 57 more. He then sold 45 of them. How many had he left?

10. $100 - (25 + 35) = ?$ $100 - 25 - 35 = ?$ [Notice carefully use of parenthesis marks.]

11. In a certain farm of 100 acres, 17 acres were orchard, 18 acres were grain field, and the remainder was pasture. How many acres of pasture were there?

12. It took 30 yards to carpet one room, 25 yards to carpet another, and 47 yards for a third room. How much more than 100 yards did the three rooms require?

13. After cutting a certain number of yards from a bolt of ribbon containing 20 yards, 9 yards were left. How many yards were cut?

14. Conrad earned at different times, \$17 and \$25 and \$30. He received \$18 as a present. How much more did he earn than was given to him?

15. There are 30 days in June and 31 days in July. If I spend 19 days out of these two months at the beach, and 12 days in the mountains, and the remainder of the time at home, how many days do I spend at home?

16. Arnold has in his library 14 books on history, 17 story books, 12 on sci'-ence, 9 on the lives of great men, and 5 picture books. How many more should he have to make 75 books?

17. There are 320 rods in a mile. From my house to Mary's is 60 rods, from her house to Julia's is 90 rods. If we walk from my house to Julia's, how much farther must we walk to walk a mile from my house?

18. There are 160 square rods in an acre. A certain garden contains an acre; 70 square rods are planted in vegetables and the remainder except 25 square rods in flower beds. How many square rods in flower beds?

19. The minuend in a certain example is 1000; the difference is 780. What is the subtrahend?

20. $(15+16+14)-(32+9)=?$ $19+17-8-17+36=?$

60

Make examples in which you use the following:

1. $75-39+18=?$ **2.** $15+8+12+?=100$

3. $18+7+13=?$ **4.** $?+3+7+8=25$

5. $45-(20+5)=?$ **6.** $45-20-5=?$

7. $12+13-15+8=?$ **8.** $84-?=50+8$

9. $19+3=100-?$ **10.** $(7+8)-(4+9)=?$

11. $(100-25)+(75-3)=?$ **12.** $(100-49)+13=?$

MULTIPLICATION AND DIVISION

61

Multiply:

4	3	2	6	4	2	11	7	12	6
4	5	9	3	5	10	2	3	2	4
8	9	5	7	8	7	9	2	10	7
3	3	5	2	2	2	2	2	8	4

62

3×3	3×5	4×3	4×4	5×5	3×6	5×4
9×2	2×12	6×4	3×7	8×3	$8+2$	7×2
7×4	2×11	3×9	2×2	2×10	9×2	5×5

63

$2\overline{)24}$	$3\overline{)24}$	$4\overline{)24}$	$6\overline{)24}$	$8\overline{)24}$	$12\overline{)24}$	$2\overline{)20}$	$4\overline{)20}$
$5\overline{)20}$	$10\overline{)20}$	$3\overline{)21}$	$7\overline{)21}$	$2\overline{)22}$	$11\overline{)22}$	$5\overline{)25}$	$2\overline{)26}$

64

$18 \div 2 = ?$	$15 \div 3 = ?$	$14 \div 2 = ?$	$28 \div 7 = ?$	$18 \div 3 = ?$
$16 \div 2 = ?$	$27 \div 3 = ?$	$28 \div 2 = ?$	$18 \div 6 = ?$	$16 \div 2 = ?$
$27 \div 9 = ?$	$26 \div 2 = ?$	$18 \div 9 = ?$	$16 \div 8 = ?$	$21 \div 7 = ?$

65

$12 = ? \times ?$	$12 =$	$14 =$	$15 =$	$16 =$	$16 =$	$18 =$
$18 = ? \times ?$	$20 =$	$20 =$	$21 =$	$22 =$	$24 =$	$24 =$
$24 = ? \times ?$	$25 =$	$26 =$	$27 =$	$28 =$	$18 =$	$30 =$

66

$4 \times 7 + 1 = ?$	$7 \times 3 + 2 = ?$	$5 \times 5 + 4 = ?$	$9 \times 3 + 1 = ?$
$4 \times 6 + 2 = ?$	$4 \times 7 + 3 = ?$	$3 \times 8 + 1 = ?$	$2 \times 12 + 1 = ?$
$5 \times 4 + 2 = ?$	$5 \times 5 + 1 = ?$	$3 \times 9 + 2 = ?$	$3 \times 8 + 2 = ?$
$2 \times 8 + 1 = ?$	$2 \times 10 + 3 = ?$	$3 \times 4 + 3 = ?$	$4 \times 7 + 3 = ?$

67

$7\overline{)24}$	$4\overline{)26}$	$7\overline{)31}$	$5\overline{)29}$	$8\overline{)25}$	$2\overline{)25}$	$4\overline{)30}$	$6\overline{)29}$
$3\overline{)26}$	$4\overline{)25}$	$7\overline{)29}$	$4\overline{)17}$	$8\overline{)17}$	$8\overline{)29}$	$5\overline{)31}$	$7\overline{)30}$

68

2×10	3×10	4×10	5×10	6×10	7×10
8×10	9×10	10×10	2×11	3×11	4×11
5×11	6×11	7×11	8×11	9×11	10×11

69

$50 = ? \times ?$	$30 =$	$70 =$	$90 =$	$22 =$	$44 =$	$88 =$
$77 = ? \times ?$	$40 =$	$80 =$	$100 =$	$60 =$	$66 =$	$55 =$
$33 = ? \times ?$	$99 =$	$20 =$	$80 =$	$100 =$	$110 =$	

70

$51 \div 10$	$32 \div 10$	$73 \div 10$	$24 \div 11$	$34 \div 11$	$56 \div 11$
$43 \div 10$	$89 \div 10$	$95 \div 10$	$45 \div 11$	$68 \div 11$	$100 \div 11$

71

$2)\underline{21}$	$3)\underline{35}$	$4)\underline{45}$	$4)\underline{41}$	$5)\underline{52}$	$5)\underline{58}$	$6)\underline{61}$	$6)\underline{63}$
$6)\underline{68}$	$7)\underline{71}$	$7)\underline{78}$	$7)\underline{80}$	$8)\underline{83}$	$8)\underline{89}$	$8)\underline{90}$	$9)\underline{100}$
$9)\underline{95}$	$9)\underline{27}$	$7)\underline{28}$	$7)\underline{29}$	$9)\underline{29}$	$3)\underline{22}$	$7)\underline{23}$	$8)\underline{25}$

72

$2 \times 5 = ?$	$4 \times 5 = ?$	$5 \times 5 = ?$	$25 = ? \times ?$	$10 = ? \times ?$
$25 + 5 = ?$	$5 \times 6 = ?$	$6 \times 5 = ?$	$35 = ? \times ?$	$20 = ? \times ?$
$30 + 5 = ?$	$5 \times 7 = ?$	$7 \times 5 = ?$	$45 = ? \times ?$	$30 = ? \times ?$
$35 + 5 = ?$	$5 \times 8 = ?$	$8 \times 5 = ?$	$55 = ? \times ?$	$40 = ? \times ?$
$40 + 5 = ?$	$5 \times 9 = ?$	$9 \times 5 = ?$	$15 = ? \times ?$	$50 = ? \times ?$
$45 + 5 = ?$	$5 \times 10 = ?$	$10 \times 5 = ?$	$5 = ? \times ?$	$60 = ? \times ?$
$50 + 5 = ?$	$5 \times 11 = ?$	$11 \times 5 = ?$		
$55 + 5 = ?$	$5 \times 12 = ?$	$12 \times 5 = ?$		

73

Count by 5's from 0 to 60 and back.
Count by 10's from 0 to 100 and back.
Count by 11's from 0 to 99 and back.
Count by 2's from 0 to 50 and back.

74

$5)\underline{31}$	$5)\underline{36}$	$5)\underline{42}$	$5)\underline{46}$	$5)\underline{63}$	$5)\underline{58}$	$5)\underline{37}$	$5)\underline{44}$
$5)\underline{48}$	$5)\underline{49}$	$5)\underline{26}$	$5)\underline{29}$	$8)\underline{25}$	$8)\underline{41}$	$7)\underline{29}$	$7)\underline{36}$

75

Count by 2's from 50 to 100. Count the same backwards.

Count by 5's from 60 to 100. Count the same backwards.

76

1. If 3 pounds of candy cost 21 cents, what does one pound cost?

2. If 5 pounds of peaches cost 25 cents, what does one pound cost?

3. If 4 yards of ribbon cost 32 cents, what does one yard cost?

4. If 7 pounds of figs cost 35 cents, what does one pound cost?

5. If 8 quarts of milk cost 40 cents, what does 1 quart cost?

6. If one box of oranges costs $2, what will 3 boxes cost?

7. If one yard of ribbon costs 10 cents, what will 5 yards cost?

8. If one pound of grapes costs 2 cents, what will 7 pounds cost?

9. If one pound of candy costs 20 cents, what will 2 pounds cost?

10. If one yard of lace costs 7 cents, what will 5 yards cost?

77

5)65	5)70	5)75	5)80	5)85	5)90	5)95	5)10
2)20	2)30	2)40	2)50	2)60	2)70	2)80	2)90
2)22	2)32	2)42	2)52	2)62	2)72	2)82	2)92

78

$24 \div 2$	$34 \div 2$	$44 \div 2$	$54 \div 2$	$64 \div 2$	$74 \div 2$	$84 \div 2$
$94 \div 2$	$26 \div 2$	$36 \div 2$	$46 \div 2$	$56 \div 2$	$66 \div 2$	$76 \div 2$
$86 \div 2$	$96 \div 2$	$28 \div 2$	$38 \div 2$	$48 \div 2$	$58 \div 2$	$68 \div 2$
$78 \div 2$	$88 \div 2$	$98 \div 2$	$36 \div 2$	$94 \div 2$	$96 \div 2$	$88 \div 2$

79

1. 10 cents will pay for —— car rides at 5 cents.
2. 20 cents will pay for —— car rides at 5 cents.
3. Twenty cents are —— dimes, or —— nickels.
4. 30 cents are —— dimes, or —— nickels.
5. Thirty cents are —— nickels more than a dime.
6. Mary has 2 dimes and a nickel. She has —— cents.
7. She can take —— car rides for her money.
8. Ray has 4 equal pieces of money, amounting to forty cents. They are ——.
9. 5 dimes are equal to —— nickels.
10. Half a dollar is —— cents.
11. It will pay —— car fares at 5 cents.
12. —— —— are a quarter of a dollar.
13. 50 cents are equal to —— quarters.
14. 4 dimes and a nickel are —— cents.
15. Thirty-five cents equal —— dimes and —— nickel.
16. At a nickel apiece James can get —— papers for —— dimes.
17. —— nickels are —— cents.
18. At 5 cents a quart, —— quarts of milk can be bought for —— cents.

19. If 1 box of berries costs 10 cents, —— boxes cost —— cents.

20. At 15 cents a box, 3 boxes of berries will cost —— cents.

21. Ray has in his bank 2 dimes, 3 nickels, and 7 pennies. He has —— cents.

22. Fanny bought 7 yards of ribbon at a half-dime a yard. The ribbon cost —— cents.

23. She gave 50 cents to pay the bill, so she received —— cents in change.

24. If it costs 25 cents to go to Pasadena and return, how many trips can I make for one dollar?

25. What will 5 trips cost?

26. At 10 cents a basket, how many baskets of oranges will one dollar buy?

27. The *News* is 2 cents. How many papers can I buy for 40 cents?

28. When ribbon is 11 cents a yard, what will 9 yards cost?

29. To how many children can I give 10 pieces of candy each if I have 73 pieces? How many pieces will be left?

30. 79 cents are equal to how many nickels and pennies?

31. There are 11 girls in my class. I bought 70 cherries for them. How many can I give each? How many shall I have left?

32. How much money are 5 dimes and 5 half-dimes?

33. Carrie had 60 cents. She bought 11 yards of ribbon at 4 cents a yard and paid two car fares at 5 cents each. How much had she left?

34. 5 pounds of candy at 15 cents a pound will cost how much?

35. Two dozen pennies, two dimes, and two nickels are how much money?

36. There are —— pints in 1 quart. There are —— pints in 2 quarts. There are —— pints in 5 quarts. There are —— pints in 10 quarts. There are —— pints in 12 quarts. There are —— pints in $\frac{1}{2}$ quart. There are —— pints in $1\frac{1}{2}$ quarts. There are —— pints in 9 quarts. There are —— pints in 11 quarts.

37. There are 14 pints in —— quarts. There are 18 pints in —— quarts. There are 24 pints in —— quarts. There are 40 pints in —— quarts. There are 28 pints in —— quarts. There are 64 pints in —— quarts. There are 100 pints in —— quarts.

80

2 pt.)12 pt. 6, or 6 qt.	2 pt.)50 pt. ?, or ? qt.	2 pt.)44 pt. ?, or ? qt.
2 pt.)48 pt. ?, or ? qt.	2 pt.)34 pt. ?, or ? qt.	2 pt.)36 pt. ?, or ? qt.
2 pt.)38 pt. ?, or ? qt.	2 pt.)60 pt. ?, or ? qt.	

81

7 qt. = —— pt.	9 qt. = —— pt.	8 qt. = —— pt.
—— qt. = 24 pt.	—— qt. = 42 pt.	—— qt. = 84 pt.
$\frac{1}{2}$ qt. = —— pt.	$1\frac{1}{2}$ qt. = —— pt.	$2\frac{1}{2}$ qt. = —— pt
$5\frac{1}{2}$ qt. = —— pt.	—— qt. = 25 pt.	—— qt. = 21 pt.

82

1. At 5 cents a pint, what will 3 quarts of berries cost?

2. At 10 cents a quart, what will 6 pints of vinegar cost?

3. At 10 cents a quart, what will 3 pints of vinegar cost?

4. At 10 cents a pint, what will 10 quarts of syrup cost?

5. Monroe picked berries at 2 cent a pint, earning one dollar. How many quarts did he pick?

6. If these berries were sold at 10 cents a pint, what did they bring?

83

1. In 1 gallon there are 4 quarts. In 2 gallons there are —— quarts.

2. In 3 gallons there are —— quarts. In 12 gallons there are —— quarts.

3. In 7 gallons there are —— quarts. In 20 gallons there are —— quarts.

4. In 11 gallons there are —— quarts.

84

1. 5 gallons are equal to 20 quarts. —— gallons are equal to 28 quarts.

2. —— gallons are equal to 40 quarts. —— gallons are equal to 44 quarts.

3. —— gallons are equal to 24 quarts. 60 quarts are equal to —— gallons.

4. 100 quarts are equal to —— gallons. 80 quarts are equal to —— gallons.

85

1. Two pints of olives were sold from a gallon. How many quarts remained?

2. How many quarts of oil in a 5-gallon can? How many pints?

3. If one can costs 80 cents, how much per pint was it?

4. When milk is 8 cents a quart, and I drink a pint each day, in how many days will I drink a dollar's worth of milk?

5. 41 quarts are —— gal. and —— qt. over.

6. 29 qt. are —— gal. and —— qt. over.

7. 30 qt. are —— gal. and —— qt. over.

8. What will 2 gallons 2 quarts of oil cost at 2 cents a pint?

9. My lamp holds a quart. How many times can I fill it from 15 gallons?

10. 28 qt. ÷ 4 qt. = 7, or 7 gallons.

11. 44 qt. ÷ 4 qt. = ——, or —— gallons.

12. 20 qt. ÷ 4 qt. = ——, or —— gallons.

13. 80 qt. ÷ 4 qt. = ——, or —— gallons.

14. 88 qt. ÷ 4 qt. = ——, or —— gallons.

15. 96 qt. ÷ 4 qt. = ——, or —— gallons.

16. 4 qt.)100 qt.
? = ? gallons.

17. 4 qt.)200 qt.
? = ? gallons.

18. 4 qt.)240 qt.
? = ? gallons.

19. 4 qt.)160 qt.
? = ? gallons.

20. How many gallons in 200 quarts?

86

1. Since 1 yard equals 3 feet, 2 yards equal —— feet.
2. Since 1 yard equals 3 feet, 10 yards equal —— feet.
3. Since 1 yard equals —— feet, 9 yards equal —— feet.
4. Since 1 yard equals —— feet, 8 yards equal —— feet.
5. Since there are 3 ft. in 1 yd., in 30 ft. there are —— yd.
6. Since there are —— ft. in 1 yd., in 33 ft. there are —— yd.
7. Since there are —— ft. in 1 yd., in 21 ft. there are —— yd.

8. 3 ft.)27 ft.
   ? = ? yd.

9. 3 ft.)21 ft.
   ? = ? yd.

10.
ft.	yd.
3 =	
9 =	
= 3	
= 9	
= 10	
45 =	
27 =	
12 =	
= 7	

11.
3 ft.
7 (yd.)
ft.

13.
21 (yd.)
3 ft.
ft.

12.
12 (yd.)
3 ft.
ft.

14.
17 (yd.)
3 ft.
ft.

87

1. At 10 cents a foot, what does 1 yd. of braid cost?

1 yd. = 3 ft. If 1 ft. = 10 cents, 3 ft. = 3 × 10 cents, or 30 cents. Therefore, at 10 cents a foot, 1 yd. of braid costs 30 cents.

2. At 5 cents a foot, what do 2 yards of braid cost?
3. At 9 cents a foot, what does 1 yard of rope cost?
4. At a dime a foot, what do 3 yards of wire cost?

88

$12 \div 2 =$	$2\overline{)12}$	$\frac{1}{2}$ of $12 =$
$20 \div 2 =$	$2\overline{)20}$	$\frac{1}{2}$ of $20 =$
$14 \div 2 =$	$2\overline{)14}$	$\frac{1}{2}$ of $14 =$
$12 \div 3 =$	$3\overline{)12}$	$\frac{1}{3}$ of $12 =$
$15 \div 3 =$	$3\overline{)15}$	$\frac{1}{3}$ of $15 =$

89

1. I divided 12 oranges equally between two sisters. How many did I give each?

2. Vern had 12 apples and he gave away $\frac{1}{2}$ of them. How many did he give away?

3. I picked $\frac{1}{2}$ of 20 boxes of oranges. How many boxes did I pick?

4. If 3 pencils cost 15 cents, what does 1 cost? Since 3 pencils cost 15 cents, one costs $\frac{1}{3}$ of 15 cents, or —— cents.

5. If 3 pencils cost 12 cents, what does 1 cost?

6. $\frac{1}{10}$ of 60? 70? 100? 40? 80?

7. $\frac{2}{10}$ of 60? 70? 100? 40? 80?

8. $\frac{9}{10}$ of 20? 30? 100? 10?

9. $\frac{1}{5}$ of 15? 25? 35? 45? 55?

10. $\frac{3}{5}$ of 15? 25? 35? 45? 55?

11. How many cents in $\frac{1}{5}$ of a dollar?

12. In $\frac{2}{5}$? $\frac{3}{5}$? $\frac{4}{5}$? $\frac{5}{5}$?

13. How many cents in $\frac{9}{10}$ of one dollar?

14. In $\frac{3}{10}$? $\frac{7}{10}$? $\frac{8}{10}$? $\frac{6}{10}$?

15. If 4 whistles cost 16 cents, what does 1 cost?

16. $\frac{1}{2}$ of 12 = ? $\frac{1}{3}$ of 12 = ? $\frac{2}{3}$ of 12 = ? $\frac{1}{4}$ of 12 = ? $\frac{3}{4}$ of 12 = ?

17. $\frac{1}{6}$ of 12 = ? $\frac{5}{6}$ of 12 = ? $\frac{3}{6}$ of 12 = ?

90

12			Add:		
12	2×12	12×2	30	5×5	6×5
12	3×12		6	5×6	6×6

Add:			Multiply:			
27	3×9	9×3	12	6	9	4
9	4×9	9×4	3	6	4	9

36 = { $3 \times$, $4 \times$, $6 \times$, $9 \times$, $12 \times$ } 3)36 4)36 6)36 9)36 12)36

3)36	3)37	3)38	4)36	4)37	4)38	4)39	6)36
6)37	6)38	6)39	9)36	9)39	12)36	12)39	12)40

91

1. How many are 3 dozen oranges?

2. There are 12 inches in 1 foot. How many inches in 3 feet?

3. How many quarts are there in 9 gallons?

4. At 6 cents a dozen, what will 8 dozen lemons cost?

5. Five 10's are how many more than 4 dozen?

6. At 12 cents a foot, what does 1 yard of wire cost?

7. At 4 cents apiece, how many tops will cost 36 cents?

8. $\frac{1}{3}$ of 36 = ? $\frac{1}{4}$ of 36 = ? $\frac{1}{6}$ of 36 = ? $\frac{1}{9}$ of 36 = ? $\frac{1}{12}$ of 36 = ?

9. $\frac{2}{3}$ of 36 = ? $\frac{2}{9}$ of 36 = ? $\frac{3}{12}$ of 36 = ? $\frac{2}{12}$ of 36 = ?

10. If 3 babies of equal weight weigh 36 pounds, what does one weigh?

11. Earl earned $\frac{4}{9}$ of $36. How much was that?

12. How many inches in $\frac{2}{3}$ of a yard?

92

1. $3 \times 8 = ?$ $24 + 8 = ?$ $4 \times 8 = ?$ $4 \times 7 = ?$ $28 + 4 = ?$ $8 \times 4 = ?$

2. Eight 4's are how many?

3. $\frac{1}{4}$ of 32 are how many?

4. How many 8's in 32?

5. How many 2's in 32?

6. Four 8's are how many?

7. What is one-fourth of thirty-two?

8. How many 4's in 32?

9. $5 \times 7 = ?$ $35 + 7 = ?$ $6 \times 7 = ?$ $6 \times 6 = ?$ $36 + 6 = ?$ $7 \times 6 = ?$

10. $\frac{1}{6}$ of 42 = ? $\frac{1}{7}$ of 42 = ? $\frac{2}{7}$ of 42 = ? $\frac{2}{6}$ of 42 = ?

11. What is five-sixths of 42?

12. What is five-sevenths of 42?

93

1. If seven copy-books cost 42 cents, what does one cost?

2. At 7 cents a piece, how many note-books will cost 42 cents?

3. How many quarts in 8 gallons?

4. How many days in six weeks?

94

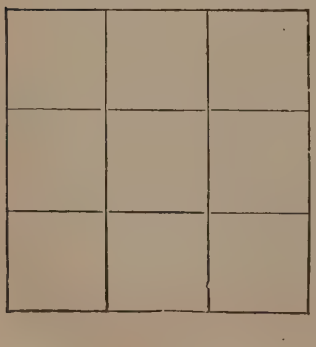
1. $3 \times 12 = ?$ $36 + 12 = ?$ $4 \times 12 = ?$ $11 \times 4 = ?$ $44 + 4 = ?$ $12 \times 4 = ?$
2. How many dozen are 48?
3. In 12 gallons there are —— quarts.
4. In four feet there are —— inches.
5. At 4 cents apiece, what will a dozen oranges cost?
6. What are three-fourths of forty-eight?

95

1. $5 \times 8 = ?$ $40 + 8 = ?$ $6 \times 8 = ?$ $7 \times 6 = ?$ $42 + 6 = ?$
2. $6\overline{)48}$ $8\overline{)48}$ $4\overline{)48}$ $12\overline{)48}$
3. 48 are how many half-dozen?
4. How many 8's in 48? 4's? 2's?
5. How many pints in 6 gallons?
6. How many are $4\frac{1}{2}$ dozen?
7. Father paid $9 apiece for 6 pictures. Find the cost.
8. $6\overline{)42}$ $6\overline{)43}$ $6\overline{)44}$ $6\overline{)50}$ $6\overline{)53}$ $6\overline{)54}$
   $9\overline{)54}$ $9\overline{)55}$ $6\overline{)55}$ $9\overline{)60}$ $9\overline{)62}$ $6\overline{)62}$

96

$9 \times 5 = ?$ $45 + 9 = ?$ $9 \times 6 = ?$ $6 \times 9 = ?$



This represents a square yard.

1. How many sq. ft. in it? In 2 sq. yd.? In 3? In 4? In 5? In 6?

97

1. Recite the table of 2's, 3's, 4's, and 5's.
2. Recite the 10's to 100.
3. Recite the 11's to 99.
4. Recite the 6's to 6×8 and 7's to 6×7.
5. Recite the 8's to 8×6 and 9's to 5×9.
6. Recite the 12's to 5×12.
7. Count 4's from 0 to 48 and back.
8. Count by 5's from 0 to 100 and back.
9. Count by 6's from 0 to 48 and back.
10. Count by 3's from 0 to 48 and back.

98

1. 2×7 3×7 4×7 5×7 6×7 7×6 7×7
2. There are —— days in 1 week. 2 weeks?
3. There are 42 days in —— weeks.
4. There are 49 days in —— weeks.
5. What is one-seventh of forty-nine?
6. 2×2 3×3 4×4 5×5 6×6 7×7

99

1. 6×5 6×6 6×7 6×8 $48 + 6$ 6×9
2. How many half-dozen in 48?
3. How many half-dozen in 54?
4. At \$6 a cord, what will 9 cords of wood cost? 8 cords?

100

6×7	$\frac{1}{6}$ of 18	$\frac{1}{9}$ of 54
8×6	$\frac{2}{6}$ of 18	$\frac{1}{6}$ of 54
6×6	$\frac{1}{6}$ of 36	$\frac{1}{8}$ of 48
9×6	$\frac{5}{6}$ of 36	$\frac{3}{8}$ of 48
7×7	$\frac{1}{7}$ of 49	$\frac{5}{9}$ of 54
5×7	$\frac{6}{7}$ of 49	$\frac{5}{8}$ of 48
7×6		
6×9		
5×7		

101

Multiply:

1.	7	4	5	8	7	9	6	6	7	6
	6	7	9	6	7	6	8	7	4	8

2. $36 \div 6$ $49 \div 7$ $54 \div 6$ $42 \div 7$ $45 \div 9$ $42 \div 6$ $48 \div 8$
3. $54 \div 9$ $45 \div 5$ $48 \div 6$ $49 \div 7$ $36 \div 9$ $36 \div 4$ $36 \div 3$
4. Recite the 6's from 6×6 to 6×11.
5. Recite the 9's to 54.
6. Recite the 4's and the 3's.
7. How many are 9 half-dozen?
8. In seven weeks, how many days?
9. How many dozen are six times 8?
10. How many working days in 7 weeks?

102

1.	6×7	7×7	5×8	6×8	$49 + 7$	$48 + 8$
2.	49 $+7$	48 $+8$	$56 - 7$	$56 - 8$	$8\overline{)56}$	$8\overline{)59}$
3.	8×7	7×8	$7\overline{)56}$	$7\overline{)57}$	$7\overline{)61}$	$7\overline{)62}$

4. At 8 cents apiece, what will 7 copy-books cost?

5. If one pint of berries costs seven cents, what do eight pints cost?

6. How many quarts in 7 gallons?

7. How many days in 8 weeks?

8. Eight times seven is how many more than five times eleven?

9. How many desks in 7 rows, if there are 8 desks in each row?

10. I paid 7 cents apiece for 8 balls. What did they all cost?

11. Seven times eight is how many more than six times nine?

103

1. $?\times?=9$ $?\times?=16$ $?\times?=25$ $?\times?=36$
   $?\times?=49$ $?\times?=64$ $?\times 8=56$ $?\times 8=64$

2. $64=$how many 8's? $64=$how many 4's?
   $64=$how many 2's? $64=$how many 16's?

3. Eight times eight is how many more than six times nine?

4. What is one-eighth ($\frac{1}{8}$) of 64?

5. What is $\frac{7}{8}$ of 64?

6. 8×8 is how many times 16?

7. From 8×8 subtract 5×12.

8. Eight gallons are how many pints?

9. How many are 5 dozen and 4?

10. At eight dollars a dozen, what will 8 dozen photographs cost?

11. Count by 8's from 0 to 64 and back.

12. What is 8×10? 8×11?

104

1. 7×10 $70-7$ 7×9 7×8 $56+7$ 7×9 9×6
   $54+9$ 9×7 10×7 8×7 $56\div8$ 9×7 6×9
2. Recite the 7's to 7×9.
3. Recite the 9's to 9×7.
4. Eight times eight is how many more than seven times nine?
5. How many are 5 dozen and 3?
6. How many days in 9 weeks?
7. 5 doz. and 3 are how many times 9?
8. 5 doz. and 4 are how many times 8?
9. 5 doz. and 3 are how many times 7?
10. There are 9 square feet in a square yard. How many square feet in 7 sq. yd.?
11. At eight cents a yard, what will 9 yards of ribbon cost?
12. $9\overline{)63}$ $9\overline{)65}$ $9\overline{)68}$ $9\overline{)70}$ $7\overline{)63}$ $7\overline{)64}$ $7\overline{)69}$ $7\overline{)70}$

105

1. Count by 6's from 0 to 72.
2. 66 is how many times 6?
3. 72 is how many times 12?
4. 72 is how many times 6?
5. How many are 6 dozen?
6. How many are 12 half-dozen?
7. How many feet are 72 inches?
8. Recite the 6's.
9. Recite the 12's to 12×6.

10. What is 8×10? Take one 8 away and what is left? Then, what is 9×8? 8×9?

11. 72 pints are how many gallons?

12. Recite the 8's to 8×11.

13. Recite the 9's to 9×8.

106

1. 9×10 $90 - 9$ 9×9 9×8 $72 + 9$ 9×9

2. Count by 9 from 0 to 99 and back.

3. Recite the 9's to 9×11.

4. 6×6 7×7 8×8 9×9

5. Add:

99	110	121
11	11	11

6. Count by 10 from 0 to 120.

7. Recite the 10's.

8. 10×11 11×11 12×11 9×9 10×10 11×11

9. How many cents in 12 dimes?

10. How many marbles in 10 dozen?

11. 11×11 is how many more than 10×12?

107

1. Add:

$72 = ? \times 12$	$84 = ? \times 12$	$96 = ? \times 12$	$132 = ? \times 12$
12	12	12	12
$= ? \times 12$	$= ? \times 12$	$= ? \times 12$	$= ? \times 12$

2. Recite the 7's. Recite the 8's. Recite the 9's. Recite the 12's.

3. Multiply:

6	9	12	8	11	9	9	12	8	7	11
7	8	10	6	11	6	8	11	7	9	9
8	11	12	12	9	9	12	12	12	9	12
8	10	12	7	6	12	9	8	11	9	7

108

$2\times 2=$ . . . . . $4\times 1=$

$2\times 3=$

$2\times 4=$ . . . . . $4\times 2=$ . . . . $8\times 1=$

$2\times 5=$

$2\times 6=$ . . . . . $4\times 3=$

$2\times 7=$

$2\times 8=$ . . . . . $4\times 4=$ . . . . $8\times 2=$

$2\times 9=$

$2\times 10=$ . . . . . $4\times 5=$

$2\times 11=$

$2\times 12=$ . . . . . $4\times 6=$ . . . . $8\times 3=$

$4\times 7=$

$4\times 8=$ . . . . $8\times 4=$

$4\times 9=$

$4\times 10=$ . . . . $8\times 5=$

$4\times 11=$

$4\times 12=$ . . . . $8\times 6=$

$8\times 7=$

All products even numbers. $8\times 8=$

$8\times 9=$

$8\times 10=$

$8\times 11=$

$8\times 12=$

109

$3 \times 2 =$ . . . . . $6 \times 1 =$

$3 \times 3 =$ . . . . . $9 \times 1 =$

$3 \times 4 =$ . . . . . $6 \times 2 =$

$3 \times 5 =$

$3 \times 6 =$ . . . . . $6 \times 3 =$ . . . . $9 \times 2 =$

$3 \times 7 =$

$3 \times 8 =$ . . . . . $6 \times 4 =$

$3 \times 9 =$ . . . . . $9 \times 3 =$

$3 \times 10 =$ . . . . . $6 \times 5 =$

$3 \times 11 =$

$3 \times 12 =$ . . . . . $6 \times 6 =$ . . . . $9 \times 4 =$

$6 \times 7 =$ $(9 \times 5 =)$

$6 \times 8 =$

$6 \times 9 =$ . . . . $9 \times 6 =$

$6 \times 10 =$ $(9 \times 7 =)$

$6 \times 11 =$

$6 \times 12 =$ . . . . $(9 \times 8 =)$

$9 \times 9 =$

Products of 3's and 9's even and odd alternate. Products of 6's all even. Notice peculiarity of products in 9's:

$9 \times 10 =$

$9 \times 11 =$

$9 \times 12 =$

18, $1 + 8 = 9$

27, $2 + 7 = 9$

36, $3 + 6 = 9$

45, $4 + 5 = 9$

54, $5 + 4 = 9$

63, $6 + 3 = 9$

72, $7 + 2 = 9$

81, $8 + 1 = 9$

90, $9 + 0 = 9$

99 = two nines

108, $1 + 0 + 8 = 9$

110

1	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48
5	10	15	20	25	30	35	40	45	50	55	60
6	12	18	24	30	36	42	48	54	60	66	72
7	14	21	28	35	42	49	56	63	70	77	84
8	16	24	32	40	48	56	64	72	80	88	96
9	18	27	36	45	54	63	72	81	90	99	108
10	20	30	40	50	60	70	80	90	100	110	120
11	22	33	44	55	66	77	88	99	110	121	132
12	24	36	48	60	72	84	96	108	120	132	144

111

1. What peculiarity do the 5's possess ?
2. What peculiarity do the 10's possess ?
3. What peculiarity do the 11's possess ?
4. Why are the 7's the hardest ?
5. How many products to learn in 2's ? 3's ? 4's ? 5's ? 6's ? 7's ? 8's ? 9's ? 10's ? 11's ? 12's ?

6. Recite the 2's, beginning at 2×2.
7. Recite the 3's, beginning at 3×3.
8. Recite the 4's, beginning at 4×4.
9. Recite the 5's, beginning at 5×5.
10. Recite the 6's, beginning at 6×6.
11. Recite the 7's, beginning at 7×7.
12. Recite the 8's, beginning at 8×8.
13. Recite the 9's, beginning at 9×9.
14. Recite the 10's, beginning at 10×10.
15. Recite the 11's, beginning at 11×11.
16. Recite the 12's, beginning at 12×12.
17. How many products in all?
18. Which ones are very easy?
19. Review the hard ones daily.
20. Write in order all the numbers occurring in any of the tables, as: 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16, 18, 20, 21, 22, 24, 25, 27, etc.
21. Tell of what numbers each is the product.

112

1. LIQUID MEASURE

2 pints make 1 quart.
4 quarts make 1 gallon.

2. MONEY

10 cents	1 dime.
10 dimes	1 dollar.

3. LONG MEASURE

12 inches	1 foot.
3 feet	1 yard.

4. COUNTING

12 things	1 dozen.
20 things	1 score.

5. TIME

60 seconds make 1 minute.
60 minutes make 1 hour.
24 hours make 1 day.
12 months make 1 year.
365 days make 1 year.

6. SQUARES

2×2 3×3 4×4 5×5 6×6 7×7 8×8
9×9 10×10 11×11 12×12

113

1. At 5 cents a foot, what do 2 yards braid cost?

2. At 24 cents a yard, what does 1 foot tape cost?

3. If one yard of rope costs 10 cents, what is that per foot?

4. When milk costs 6 cents per quart, what does half a gallon cost?

5. What will $1\frac{1}{2}$ gallons of water cost at 10 cents?

6. At 7 cents a pint, what does $\frac{1}{2}$ quart wine cost?

7. What will 1 yard and 1 foot of moulding cost at 11 cents a foot?

8. What will 1 gallon and 1 quart of milk cost at 5 cents a quart?

9. 12 quarts of berries at 2 cents a pint cost how much?

10. Fanny went to school every school day but one for 10 weeks. How many days did she go?

11. Her brother went every school day for 37 days. How many weeks did he go?

12. In a box are 72 eggs. How many half-dozen?

13. How many are $2\frac{1}{2}$ dozen? $3\frac{1}{2}$ dozen?

14. 24 days are how many weeks and days?

15. In 50 days there are how many weeks?

16. Dora used 24 buttons on her dress. What did they cost at 25 cents per dozen?

17. What will 48 eggs cost at 15 cents a dozen?

18. At 30 cents a dozen, what will 3 oranges cost?

19. How much will a half-dozen oranges cost at 40 cents a dozen?

20. I bought $2\frac{1}{2}$ dozen eggs at 10 cents, giving 50 cents in payment. How much change should the merchant give me?

21. How many inches in 1 foot and 9 inches.

22. What will 2 yards of lace cost at 2 cents an inch?

23. A foot and a half are how many inches?

24. How many inches in one-half yard?

25. 11 pints are how many more than 2 gal.?

26. John has a dollar in his bank. The coins are all dimes. How many are there?

27. How many car fares will they pay?

28. In a certain box were 100 oranges. How many were left after 5 dozen were taken out?

29. Ray bought 75 cents' worth of paper and gave one dollar in payment. What change did he receive?

30. 52 pints are how many quarts?
60 pints are how many quarts?
100 pints are how many quarts?
100 quarts are how many gallons?
88 quarts are how many gallons?
98 quarts are how many gallons?

31. James had one dollar and he bought 11 pounds of fruit at 5 cents a pound. How much money had he left?

32. Four yards of ribbon at 15 cents a yard cost —— cents.

33. Thirteen yards of lace at 5 cents a yard cost —— cents.

34. At 3 cents a yard, —— yards of tape can be bought for 63 cents.

35. 66 are how many dozen?

36. How many minutes in a quarter of an hour?

37. One-half hour is how many minutes?

38. It takes me $\frac{3}{4}$ of an hour to walk a mile. How many minutes is that?

39. $1\frac{1}{2}$ hours are how many minutes?

40. May had 70 cents and spent $\frac{1}{2}$ dollar. How much had she left?

41. How many score in 84?

42. From 100 pints I drew 8 gallons. How many pints were left?

43. 96 inches are how many feet?

44. 96 minutes are how many more minutes than an hour?

45. 99 are how many dozen? How many score?

46. At $\frac{1}{2}$ cent apiece, what will 3 apples cost? 5 apples? 11 apples? 8 apples?

114

1. I walked 3 miles an hour for 8 hours on Monday, and 4 miles an hour for 9 hours on Tuesday. How far did I walk in the two days?

2. Mr. Brown paid 7 dollars a head for 8 calves, and 5 dollars a head for 8 sheep. What did he pay for both? For which did he pay more, and how much?

3. How much more will 9 yards of ribbon at 6 cents a yard cost than 11 yards of lace at 5 cents?

4. I paid 6 dollars for a hat, 3 dollars for a pair of shoes, 1 dollar for a pair of gloves, $\frac{1}{2}$ dollar for a handkerchief. What did I pay for all?

5. Ruby had 10 dollars. She paid 50 cents for a collar, 50 cents for a ribbon, 75 cents for stockings, 25 cents for a handkerchief, 1 dollar for a par'-a-sol. How much had she left?

6. A man paid 79 dollars for a horse, and sold it for 100 dollars. How much did he make?

7. A man bought a cow for 81 dollars, and sold her for eight-ninths of what she cost. How much did he lose?

Gain or loss and how much?

8. Bought for 100 dollars, sold for 63 dollars.

9. Bought for 55 cents, sold for a dollar.

10. Bought 12 yards at 6 cents a yard, sold it at 10 cents a yard.

115

1. If 2 pounds of candy cost 10 cents, what will 3 pounds cost at same rate?

2. If there are 12 trees in three equal rows, how many are there in two rows?

3. Harry can read 3 pages in 30 minutes. How long will it take him to read 5 pages?

4. Fanny divided 15 cents equally among three children. How many cents would she give to 7 at the same rate?

5. Randolph planted 24 beans in 8 pots, putting the same number in each pot. How many did he put in 3 pots?

6. Hilda picks 4 boxes of berries in 20 minutes. How long will it take her to pick 5 boxes?

7. Mary makes 9 badges out of a yard of ribbon. How many inches of ribbon will be required for 4 badges?

8. Frances bought 40 sticks of candy for her 10 guests. She then invited 4 more guests. How many more sticks must she buy so as to give as many sticks to each as she planned to give?

9. 44 yards of carpet were cut into 11 equal strips. How many yards were there in 9 strips?

10. If 12 acres of land cost $600, what will 10 acres cost at the same rate?

116

1. If 5 yards of calico cost 20 cents, how many yards can be bought for 30 cents?

2. If 30 sheets of paper will make 10 kites, how many kites can be made from 20 sheets?

3. If it requires 45 loaves of bread to feed a crew 3 days, how many days will 60 loaves feed them?

4. I paid $3 for 6 theatre tickets. How much would 5 have cost me?

5. A tool merchant paid $44 for 22 rip saws. How much would 30 have cost at the same rate?

6. It required 5 loaves of bread to make 60 sandwiches. How many sandwiches were made from 3 loaves?

7. If 20 pounds of berries cost 60 cents, one dollar will buy how many pounds?

8. If a pasture will last 40 sheep 120 days, how many sheep will it last 80 days?

9. When a 6-foot post casts a shadow 18 feet long, how long is a pole that casts a shadow 60 feet long?

10. When it takes 5 men 12 days to do a certain piece of work, how many men can do it in 10 days?

117

1. If it takes 6 men 3 days to do a certain piece of work, how long would it take 2 men?

2. If a stick 2 feet high casts a shadow 4 feet long, how long a shadow would a post 6 feet high cast at the same time?

3. If 4 men dig 28 feet of ditch in a certain time, how many feet could 3 men dig in the same time?

4. If a railroad train travels 90 miles in 3 hours, how far will it travel in 5 hours at the same rate?

5. A tailor used 63 yards of cloth in making 9 suits. How many suits of the same kind can he make from 84 yards?

6. I used 50 lbs. of fruit in making 10 quarts of jam. How many pounds would be required for 6 quarts?

7. At 40 cents a gallon, what will 17 quarts of syrup cost?

8. At 40 cents a gallon, how many pints of wine will cost one dollar?

118

1. At $\frac{1}{2}$ cent apiece, what will 3 apples cost? 5 apples? 11 apples? 8 apples?

2. At a half-dollar apiece, what will 12 sailor hats cost? 15? 21? 25?

3. At the rate of $\frac{1}{2}$ mile a minute, how far will a train go in 50 minutes? 60 minutes? 100 minutes? 1 hour?

4. At the rate of a mile in 2 minutes, how far will a train go in $\frac{1}{2}$ hour?

5. At a penny apiece, how many papers can I get for half a dollar?

6. At a cent for a half-pint of milk, how much will a quart cost?

7. At $\frac{1}{2}$ cent a foot, what will 1 yard of rope cost?

8. At one-half dollar a quart, what will a gallon of wine cost?

9. At the rate of a half-pound a day, how much sugar would a family use in one week?

10. I had 100 dollars. I put $\frac{1}{2}$ of it in the bank. I paid $\frac{1}{2}$ of what I had left for rent. I paid $\frac{1}{2}$ of what I then had left for bills. How much had I after that?

119

1. How many cents are $\frac{1}{2}$ dollar? $\frac{1}{4}$? $\frac{3}{4}$? $\frac{1}{5}$? $\frac{4}{5}$? $\frac{1}{10}$? $\frac{3}{10}$? $\frac{5}{10}$? $\frac{9}{10}$?

2. Change to inches:

1 ft. 10 in.	1 ft. 5 in.	1 ft. 3 in.	3 ft. 6 in.
1 ft. 7 in.	4 ft. 1 in.	1 ft. 9 in.	5 ft. 7 in.
1 ft. 11 in.	5 ft. 10 in.		

$1\frac{1}{2}$ ft.	$1\frac{1}{3}$ ft.	$1\frac{2}{3}$ ft.	$1\frac{1}{4}$ ft.	$1\frac{3}{4}$ ft.
$1\frac{1}{6}$ ft.	$1\frac{5}{6}$ ft.	$1\frac{1}{12}$ ft.	$1\frac{5}{12}$ ft.	$1\frac{11}{12}$ ft.

3. Change to pints:

1 qt. 1 pt.	1 gal. 1 qt. 1 pt.	2 gal. 2 qt. 1 pt.
1 gal. 1 qt.	2 gal. 1 qt. 1 pt.	1 gal. 1 pt.
2 gal. 3 qt.	3 qt. 1 pt.	2 gal. 1 qt.
2 qt. 1 pt.	2 gal. 1 pt.	2 gal. 3 qt.

120

1. $\frac{1}{2}$ hour is how many minutes? $\frac{1}{3}$ hour? $\frac{2}{3}$ hour? $\frac{1}{4}$ hour? $\frac{3}{4}$ hour?

2. Mary's mother said she might stay 3 quarters of an hour. How many minutes was that?

3. If it takes Dora a quarter of an hour to walk to school, at what time must she start so that she may be there 5 minutes before nine?

4. If I can walk a mile in half an hour, how far can I walk in 90 min.?

5. From nine o'clock to half past ten is how many minutes?

6. How many minutes from quarter before 11 o'clock to noon?

7. John began to read at half past seven last evening, and read three-quarters of an hour. What time was it when he stopped?

8. At the rate of 8 miles an hour, how far can a boy ride in 30 min.? In 15 min.? 45 min.?

9. At 25 cents apiece, how many caps will cost \$1.25?

10. At the rate of 10 cents a quart, how many quarts of milk can be had for \$1.44, and how much change will there be?

11. At 10 cents a dozen, what will 144 buttons cost?

12. At 11 cents a dozen, what will 132 buckles cost?

13. At 12 cents a dozen, what will 108 pins cost?

14. At 10 cents a foot, what will 110 inches of moulding cost?

15. At $11 a head, what will 11 calves cost?

16. If 1 ton of hay costs $12, what will $10\frac{1}{2}$ tons cost?

17. $2\overline{)102}$ $3\overline{)102}$ $2\overline{)104}$ $8\overline{)104}$ $3\overline{)105}$ $5\overline{)105}$ $7\overline{)107}$

18. $102 will buy 3 yards of lace at how much per yard?

19. Joe put $\frac{1}{2}$ of $1.02 in the bank. How much did he put in the bank?

20. How many weeks are 105 days?

21. 104 pints are how many gallons?

121

1. A man had 104 bales of hay. He sold half of it at $1 a bale. What did he get for it?

2. I bought $\frac{1}{5}$ of 105 acres of land at $2 an acre. What did it cost me?

3. John paid $\frac{1}{10}$ of $100 for a suit of clothes. What did the suit cost him?

4. At the rate of 3 for a quarter, how many spools of thread will cost $1.25?

5. I had $1.09. I bought 9 doz. lemons at a cent apiece. How much had I left?

6. Edith had 11 dozen seeds. She planted 10 seeds in each one of 11 boxes. How many had she left?

7. Frank has 12 rabbits in each of 11 pens and two rabbits besides. How many rabbits has he?

8. At 5 cents apiece, how many pencils can be bought for $1.05?

9. How many loaves of bread will cost $1 if 3 loaves cost 25 cents?

10. How many quarts in 104 pints?

11.

2)106	2)108	3)108	4)108	6)108
9)108	12)108	2)110	10)110	11)110

12. Subtract:

120	131	143	140	138	129	141	144	132
108	106	110	106	108	104	105	132	129

122

1. A farmer has three fields of 54 acres each. How many acres in the three fields?

2. It is 54 miles from May's home to her uncle's. How far is it there and back?

3. A man divided $108 equally among his four sons. How much did each receive?

4. In my orchard there are 108 trees in 6 equal rows. How many trees in a row?

5. How many miles of iron car rails will it take to lay 54 miles of track?

6. A boy divided 108 feet of kite string equally among three playmates. How many feet did he give to each?

7. 106 horses will make how many two-horse teams?

8. Kate has read half of a book of 108 pages. How many pages has she read?

9. Mr. Smith has 106 acres of land. $\frac{1}{2}$ of it is in orchard. How large is his orchard?

10. What will 108 feet of rope cost at 10 cents a yard?

11. 3)111 2)112 7)112 8)112 2)114 3)114 6)114

5)115 4)111 5)111 6)112 7)113 8)114 9)111

12. Subtract:

135	142	137	140	130	114	112	113	142	111
114	112	111	114	112	99	38	77	59	79

123

1. If it takes 5 yards of cloth for one suit, how many suits can be made from 110 yards?

2. At 10 cents a dozen, how many dozen pens can be bought for $1.10?

3. At 5 cents apiece, how many oranges will cost $1.10?

4. It takes 11 feet of boards to make a table. How many tables of the same kind can be made from 110 feet of boards?

5. If it takes one man 110 days to do a piece of work, how long would it take 10 men?

6. If it takes 3 men 37 days to do a piece of work, how long would it take 1 man?

7. If 11 men do a piece of work in 12 days, how long would it take 1 man to do it?

8. A baker divided 111 cookies among 3 poor families. How many did he give to each family?

9. 111 feet are how many yards?

10. $\frac{1}{2}$ of 110 minus $\frac{1}{2}$ of 100 = ?

11. 12)116 4)116 3)117 9)117 8)117 7)117 6)117

12. Subtract:

120	140	135	140	125	144	121	131	133	151
116	117	117	116	117	116	59	48	67	98

124

1. $8 \times 7 \times 2 \times 2 = ?$ $4 \times 7 \times 2 \times 2 = ?$

2. $56 is half of my money. What is my money?

3. If a train goes 28 miles an hour, how far does it go in 4 hours?

4. Each side of a square field is 28 rods. How many rods around the field?

5. How many weeks are 112 days?

6. Each side of a square field is 30 rods. How far around it?

7. It is 100 rods around a certain square field, how long is one side?

8. How many weeks in 114 working days?

9. 38 yards are how many feet?

10. What will 23 pounds of rice cost at 5 cents a pound?

11. If it takes 4 men 29 days to do a piece of work, how long will it take one man to do it?

12. 117 inches are how many yards?

13. $9 \times 13 = ?$

14. It is 117 feet around a flower bed having 3 equal sides. What is the length of one side?

15. 117 and how many are 10 dozen?

125

1. $2\overline{)118}$ $7\overline{)119}$ $2\overline{)115}$ $7\overline{)115}$ $7\overline{)119}$ $7\overline{)109}$ $7\overline{)105}$

2. There are 118 tons of hay in two equal stacks. How many tons in each?

3. Miles traveled in France for 119 days. How many weeks was that?

4. 118 feet of rope reach from the ground to the top of a flag pole and back to the ground. How high is the pole?

5. A man walks 119 miles in a week. If he walks the same distance each day, how far does he walk in a day?

6. $2\overline{)120}$ $3\overline{)120}$ $4\overline{)120}$ $5\overline{)120}$ $6\overline{)120}$ $8\overline{)120}$ $11\overline{)120}$

$12\overline{)120}$ $7\overline{)120}$ $9\overline{)120}$ $10\overline{)120}$ $7\overline{)121}$ $8\overline{)121}$ $9\overline{)121}$

7. A certain street is 120 feet wide. How many feet from one side to the middle?

8. 120 pupils are marching 3 abreast. How many in each line?

9. A milkman has 120 quarts of milk in gallon cans. How many cans does he need?

10. At a nickel apiece —— stamps would cost $1.20.

11. How many half-dozen in 120 units?

12. Divide 120 into 8 equal parts. What is one part?

13. How many dimes is $1.20?

14. 120 inches are how many feet?

15. There are 24 hours in a day. How many hours in 5 days?

Change to units:

16. $1\frac{1}{2}$ dozen $1\frac{1}{3}$ dozen $1\frac{2}{3}$ dozen $2\frac{1}{2}$ dozen $2\frac{1}{3}$ dozen

17. $3\frac{2}{3}$ dozen $3\frac{1}{2}$ dozen $4\frac{1}{3}$ dozen $5\frac{2}{3}$ dozen $4\frac{1}{2}$ dozen

18. $\frac{1}{4}$ dozen $\frac{3}{4}$ dozen $5\frac{1}{2}$ dozen $3\frac{1}{4}$ dozen $4\frac{3}{4}$ dozen

19. $6\frac{1}{2}$ dozen $5\frac{1}{4}$ dozen $7\frac{3}{4}$ dozen $7\frac{1}{2}$ dozen $7\frac{1}{4}$ dozen

20. $\frac{10}{12}$ dozen $3\frac{5}{6}$ dozen $2\frac{10}{12}$ dozen $7\frac{5}{6}$ dozen $4\frac{2}{3}$ dozen

Change to dozen and units:

21. 51 42 45 75 100 39 29 49 59 99

Change to dozen:

22. 18 30 42 66 78 25 37 49 61 73

23. How many units in half a dozen dozen? ($\frac{1}{2}$ of 6) dozen? ($\frac{1}{2}$ of 10) dozen?

24. 100 − 3 dozen = ? 100 − 6 dozen = ? 100 − 5 dozen = ?

25. 100 − 7 dozen = ? 100 − 4 dozen = ? 100 − 2 dozen = ?

126

1. What will $\frac{1}{2}$ dozen oranges cost at the rate of two for a dime?

2. What will $\frac{1}{3}$ dozen eggs cost at 20 cents a dozen?

3. What will $1\frac{1}{2}$ dozen lemons cost at the rate of 3 dozen for 40 cents?

3 dozen = 40 cents.

$1\frac{1}{2}$ dozen = —— cents.

4. What will 9 eggs cost at 20 cents a dozen?

5. There are $2\frac{1}{2}$ dozen apples in a certain box. What are they worth at 2 cents apiece?

6. If $\frac{1}{2}$ dozen bananas cost 10 cents, what does a dozen cost?

7. At the rate of 3 for 5 cents, what will a dozen oranges cost?

8. At the rate of 3 for 5 cents, how many oranges can be bought for 30 cents?

3 oranges = 5 cents.

—— oranges = 30 cents.

9. Jane had 3 yards of ribbon. She cut it into two equal pieces. How long was each piece?

10. Mary found 3 eggs. What part of a dozen did she find?

11. 6 inches are what part of a foot?

127

1. See if you can divide any of these numbers without something remaining: 101, 103, 107, 109.

2. Find all such numbers between 120 and 144.

3. At $11 a ton, what do 11 tons of hay cost?

4. 132 units are how many dozen?

5. What is $\frac{1}{2}$ of $140?

6. 12 dozen are equal to how many units?

7. How many hours in 6 days?

8. A pound is 16 ounces. Two pounds are how many ounces? 3 pounds? 4 pounds? 5 pounds? 6 pounds? 7 pounds? 8 pounds? 9 pounds?

9. Multiply:

16	16	16	16	16	16	16
3	4	5	6	7	8	9

128

Read these numbers:

1000	1001	1005	1008	1009	1010	1012	1016	1019
1020	1022	1024	1027	1030	1035	1039	1040	1044
1050	1057	1060	1061	1067	1070	1078	1080	1083
1090	1099	1100	1101	1102	1105	1106	1110	1111
1114	1120	1249	1357	1400	1501	1605	1700	1701
1754	1781	1895	1903	1958	2000	2100	2107	2111
2200	2340	2404	2493	2500	2501	2512	2606	2792
2809	3000	3002	3020	3200	3202	3220	3222	3709
3789	3904	3940	4000	4100	4010	4270	4705	4809
4900	5000	5012	6303	6909	7101	7529	8402	8910
9000	9101	9035	9205	9999	10000	8723	5090	3724

Read these numbers and write them from dictation:

11530	10207	12400	12075	11001	9005	11249	12020
13095	13203	14270	14027	15225	15025	10030	16730
17025	18009	18888	18400	19500	19050	19005	10950
20283	21000	22222	23800	24750	25000	40500	29207
26240	27024	28005	29347	30278	30008	30078	31100
31750	32041	32007	33445	33275	34475	35550	36405
37291	38478	39989	40000	40100	41100	41110	42500
43500	44278	45900	46640	47488	48100	49473	50000
52251	54785	55290	58707	59005	60200	69583	70750
74017	60004	81010	31416	25008	30249	67211	60011

129

Divide by 10:

200	300	400	500	210	340	480	530	250	330
460	510	290	370	440	550	240	320	450	590
970	650	930	350	420	280	660	770	730	800
1220	1350	1500	1470	1900	1580	1700	1860	1100	1940
2000	2100	5800	2400	4790	3640	2790	5050	4040	1010
2020	4270	3480	9360	8080	6230	9490	3270	7440	8880

Divide by 10; by 100:

5000	3000	9000	3010	4200	7500	8500	7500	9100	9000
10000	12000	15000	20000	24000	500	600	700	800	900

130

Divide by 20:

100	300	500	700	900	200	360	580	760	920
220	400	520	740	940	280	420	600	800	960
240	440	640	880	980	40	80	60	50	90

(Divide in this way, if easier: $100 = 5$ twenties. $300 = 3 \times 5$ twenties, or 15 twenties. $60 = 3$ twenties, $360 = 20 \times 18$.)

Divide by 30:

300	330	360	390	270	240	420	450	480	600
660	630	690	720	750	900	960	990	810	840
120	150	180	210	510	780	900	930	3000	6000

Divide by 40:

200	400	800	240	280	420	320	360	440	480
160	820	120	520	640	680	720	620	800	880
760	840	4000	560	560	600	640	960	2000	8000

Divide by 50:

100	200	300	400	550	600	700	800	900	1000
150	250	350	450	500	650	750	850	950	1050
1500	2000	2500	3000	3500	4500	5000	6000	5500	1200

Divide by 100:

700	900	1100	1300	800	300	1500	2000	500	1300
1800	2500	2600	1900	1700	1400	2100	3000	3100	3300

60)360	60)3600	60)6000	70)1400	70)280
70)7000	80)240	80)2400	80)8000	90)3600
90)810	90)1800	60)3000	80)4800	60)4800

131

(1)

divisor)dividend
quotient

(2)

quotient
divisor)dividend

(3) (4)

divisor) dividend (quotient Dividend ÷ divisor = quotient.

No. 1 is called short division. This form should be used whenever possible.

Nos. 2 and 3 are two ways of writing long division.

No. 4 is the form for analysis.

There is still another way, which you will use later. It is this:

$\frac{\text{dividend}}{\text{divisor}} = \text{quotient.}$ $\frac{12}{2} = 6$ which is the same as $12 \div 2 = 6$.

132

Tell how many figures (besides remainder) there will be in the quotient:

13)1796	14)2049	15)3209	16)1845	17)2748	18)72345
19)2764	20)2109	21)3000	22)39473	13)5429	24)2403
24)2472	17)1836	19)1902	18)1965	16)4400	14)3275

When a divisor of two figures is not contained in the first two figures of the dividend, there will be one less place in the quotient.

25)19734	26)10345	27)2000	18)1765
41)40000	32)16732	17)10830	23)2267
28)20089	121)1229	189)15934	267)2500

133

Dividend	Divisor	Number of figures in the quotient	
10634	15	——	59)7634(
19634	15	——	59)20476(
9634	15	——	374)20476(
27395	27	——	893)89600(
20395	27	——	26)50762(
40000	35	——	19)18032075(
35000	35	——	219)18032075(
16748	193	——	49)593(
27469	172	——	273)1000(
5349	158	——	75)1000(

134

How many figures in the quotient?

$3000 \div 25$	$16000 \div 15$	$295378 \div 9$
$1758 \div 9$	$25000 \div 374$	$163842 \div 19$
$1478 \div 115$	$14308 \div 7$	$153876 \div 13$
$1034 \div 276$	$11596 \div 113$	$437429 \div 179$
$4000 \div 50$	$12000 \div 300$	$900000 \div 10$

FRACTIONS

135

HALVES

1. I had two dollars and I spent one. What part of my money did I spend?

2. I had \$4 and spent one-half of it. How much did I spend?

3. Two yards of silk cost $6. What did one yard cost?

4. There are 8 pints in a gallon. How many pints in $\frac{1}{2}$ gallon?

5. How many cents in a half dime?

6. How many are a half-dozen eggs?

7. If 14 marbles are divided between two boys, how many will each receive?

8. $16 was the price of two tickets to San Francisco. What was the price of one?

9. What is one-half of eighteen?

10. Ten cents is what part of 20 cents?

11

$\frac{1}{2}$ of 2 = ?	$\frac{1}{2}$ of 14 = ?
4	16
6	18
8	20
10	22
12	24

12

$\frac{1}{2}$ of 20 = ?	$\frac{1}{2}$ of 18 = ?
14	12
8	16
10	24
6	22
4	2

13

$\frac{1}{2}$ of 26 = ?	$\frac{1}{2}$ of 38 = ?
28	40
30	42
32	44
34	46
36	48

14. Numbers that can be divided by two without a remainder are called even numbers.

15. Give the even numbers from 50 to 60, and then give $\frac{1}{2}$ of each.

16. Mention the numbers between 60 and 70 that are exactly divisible by 2.

Exactly divisible means that may be divided without any remainder.

17. Give $\frac{1}{2}$ of the even numbers from 70 to 80.

18. 5 is $\frac{1}{2}$ of what number?
6 is $\frac{1}{2}$ of what number?
10 is $\frac{1}{2}$ of what number?
12 is $\frac{1}{2}$ of what number?

19. 25 is $\frac{1}{2}$ of what number?
24 is $\frac{1}{2}$ of what number?
50 is $\frac{1}{2}$ of what number?
36 is $\frac{1}{2}$ of what number?

20. 2 is what part of 4?
3 is what part of 6?
10 is what part of 20?
50 is what part of 100?
4 is what part of 8?
25 is what part of 50?

21. If I cut a pie into two equal pieces, each piece is called a half. There are, then, how many halves in anything?

22. Two halves of 20 are how many?
$\frac{2}{2}$ of 10 are how many? $\frac{2}{2}$ of 24 are how many?

23. $\frac{1}{2}$ of 24? 36? 48? 40? 72? 84?

24. $\frac{2}{2}$ of each number above?

25. Four half-dollars are how many whole dollars? Six half-dollars?

26. How many whole pages in 10 half-pages?

27. Twenty halves are how many whole things? 18 halves? 22 halves?

28. Tell how many whole things in these: $\frac{8}{2}$, $\frac{24}{2}$, $\frac{30}{2}$, $\frac{100}{2}$, $\frac{50}{2}$, $\frac{40}{2}$, $\frac{44}{2}$.

29. I have five half-dollars. How much money have I?

30. Joe has 3 half-dollars. How much money has he?

31. Seven half-dollars are how much?

32. Nine halves are how many whole things and what over?

33. Change these halves to whole things and halves over: $\frac{9}{2}$, $\frac{11}{2}$, $\frac{13}{2}$, $\frac{15}{2}$, $\frac{17}{2}$, $\frac{19}{2}$, $\frac{21}{2}$, $\frac{23}{2}$, $\frac{25}{2}$, $\frac{27}{2}$, $\frac{29}{2}$.

34. If you have a dollar and a half, how many half-dollars have you?

35. $\$1\frac{1}{2}$ are how many times $\$\frac{1}{2}$?

36. At a half-dollar a trip, how many trips can you take for \$1.50? \$2.50? \$3.50?

37. Change these to half-dollars: $\$4\frac{1}{2}$, $\$1\frac{1}{2}$, $\$10\frac{1}{2}$, $\$5\frac{1}{2}$, $\$7\frac{1}{2}$.

38. Change to halves: $3\frac{1}{2}$, $9\frac{1}{2}$, $6\frac{1}{2}$, $12\frac{1}{2}$, $11\frac{1}{2}$.

39. John deposited in the bank at three different times: $\$\frac{1}{2}$, $\$1\frac{1}{2}$, and \$2. How much in all?

40. $\frac{1}{2}+\frac{1}{2}+1\frac{1}{2}=?$ $2\frac{1}{2}+2\frac{1}{2}+1\frac{1}{2}=?$ $2+1\frac{1}{2}+\frac{1}{2}+\frac{1}{2}=?$

$1\frac{1}{2}+1\frac{1}{2}+\frac{1}{2}=?$ $1\frac{1}{2}+2\frac{1}{2}+\frac{1}{2}=?$ $\frac{1}{2}+\frac{1}{2}+\frac{1}{2}+2\frac{1}{2}=?$

$5\frac{1}{2}+1\frac{1}{2}+\frac{1}{2}+\frac{1}{2}=?$ $3\frac{1}{2}+2\frac{1}{2}+\frac{1}{2}+5\frac{1}{2}=?$

41. Oliver had five dollars in the bank and drew out $\$2\frac{1}{2}$. How much had he left? What part of his money did he draw?

42. Lulu had \$4. She paid $\$2\frac{1}{2}$ for a pair of shoes, and one dollar for a car ticket. How much had she left?

43. $\frac{7}{2} - \frac{1}{2} - \frac{1}{2} - 1\frac{1}{2} = ?$ $\quad 3\frac{1}{2} - \frac{1}{2} - \frac{1}{2} - \frac{1}{2} = ?$

$\frac{10}{2} - 1 - \frac{1}{2} - \frac{1}{2} = ?$ $\quad 5 - 1\frac{1}{2} - \frac{1}{2} - \frac{1}{2} = ?$

44. Subtract:

\$14.50	\$10.00	\$20.00	\$5.00	\$25.00
2.50	4.50	15.50	1.75	17.25

45.

$5 \times \frac{1}{2} = ?$	$11 \times \frac{1}{2} = ?$	$4 \times \frac{1}{2} = ?$	$2 \times \frac{1}{2} = ?$	$\frac{1}{2} \times 15 = ?$
$6 \times \frac{1}{2} = ?$	$3 \times \frac{1}{2} = ?$	$9 \times \frac{1}{2} = ?$	$20 \times \frac{1}{2} = ?$	$\frac{1}{2} \times 25 = ?$
$7 \times \frac{1}{2} = ?$	$12 \times \frac{1}{2} = ?$	$10 \times \frac{1}{2} = ?$	$8 \times \frac{1}{2} = ?$	$\frac{1}{2} \times 21 = ?$

46. How much will 5 presents cost at \$$\frac{1}{2}$ apiece?

47. What will you receive for picking 12 boxes of berries at $\frac{1}{2}$ cent a box?

48. If it takes $\frac{1}{2}$ yard to make one badge, how many yards of ribbon will be needed for 20 badges? For 25? 50? 30? 45?

49. A milkman has 7 gallon cans, each half full of milk. How many gallons of milk has he?

50. Roy walks a half-mile to school. How far does he walk in 19 days?

51. Half the pupils in a certain class are 27. How many in the class?

52. Vane's father gave him \$5.50, which was half as much as Vane had earned. How much had he then?

53. If it takes 30 minutes to go to the post office, how many hours should it take to go seven times as far?

54. Four pints are what part of a gallon?

55. In a certain school of 500 pupils there are 261 boys. Are they more or less than half the school?

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QUARTERS

1. How many twenty-five cent pieces make a dollar?

2. How many quarters in a dollar?

3. How many quarters in a half-dollar?

4. How many quarters in a dollar and a half?

5. A quarter of anything is also called one-fourth; written, $\frac{1}{4}$.

6. How many fourths in anything?

7. Mother cut a cake into halves, and then cut each half into two pieces. How many pieces were there then? Each piece was what part of the whole?

8. $\frac{1}{2}=\frac{}{4}$ $1=\frac{}{4}$ $\frac{2}{2}=\frac{}{4}$ $2=\frac{}{4}$

9.

$\frac{3}{2}=\frac{}{4}$	$\frac{10}{2}=\frac{}{4}$	**10.**	$3=\frac{}{4}$	$20=\frac{}{4}$	**11.**	$1\frac{1}{4}=\frac{}{4}$	$2\frac{1}{4}=\frac{}{4}$
$\frac{4}{2}=\frac{}{4}$	$\frac{7}{2}=\frac{}{4}$		$5=\frac{}{4}$	$4=\frac{}{4}$		$1\frac{2}{4}=\frac{}{4}$	$3\frac{1}{4}=\frac{}{4}$
$\frac{5}{2}=\frac{}{4}$	$\frac{8}{2}=\frac{}{4}$		$10=\frac{}{4}$	$6=\frac{}{4}$		$1\frac{3}{4}=\frac{}{4}$	$3\frac{3}{4}=\frac{}{4}$
$\frac{6}{2}=\frac{}{4}$	$\frac{9}{2}=\frac{}{4}$		$12=\frac{}{4}$	$7=\frac{}{4}$		$2\frac{3}{4}=\frac{}{4}$	$4\frac{1}{4}=\frac{}{4}$

12. $1\frac{1}{2}=\frac{}{4}$ $2\frac{1}{2}=\frac{}{4}$ $3\frac{1}{2}=\frac{}{4}$ $4\frac{1}{2}=\frac{}{4}$ $5\frac{1}{2}=\frac{}{4}$

13.

$\$1\frac{1}{2}+\$\frac{1}{4}=?$	$1\frac{1}{2}+1\frac{1}{4}=?$	$\frac{3}{4}+\frac{3}{4}+\frac{3}{4}=?$	$\frac{1}{2}+\frac{3}{4}+\frac{1}{4}=?$
$2\frac{1}{2}+\frac{2}{4}=?$	$1\frac{1}{2}+1\frac{2}{4}=?$	$\frac{1}{4}+\frac{3}{4}+\frac{2}{4}=?$	$1\frac{1}{4}+\frac{1}{4}+\frac{1}{2}=?$
$1\frac{1}{2}+1\frac{3}{4}=?$	$1\frac{1}{2}+\frac{3}{4}=?$	$\frac{1}{2}-\frac{1}{4}-\frac{1}{4}=?$	$1\frac{1}{2}+1\frac{1}{4}+\frac{3}{4}=?$

14.

15. Selden has 7 quarters. How much money has he?

16. What will 10 tops cost at a quarter apiece?

17. Charles walked nine quarters of a mile. How many miles was that?

18. How many apples were cut up to make 12 quarters? 20 quarters? 16?

19. Change these quarters to whole things: $\frac{8}{4}$, $\frac{24}{4}$, $\frac{28}{4}$, $\frac{32}{4}$, $\frac{36}{4}$, $\frac{40}{4}$, $\frac{80}{4}$, $\frac{100}{4}$.

20. Change these quarters: $\frac{7}{4}$, $\frac{11}{4}$, $\frac{15}{4}$, $\frac{13}{4}$, $\frac{9}{4}$, $\frac{21}{4}$, $\frac{25}{4}$, $\frac{30}{4}$.

21. What is one-fourth of 20? 40? 60? 80? 100?

22. What is $\frac{1}{4}$ of 16? 36? 48? 84? 60? 100? 96? 88?

23. 3 is $\frac{1}{4}$ of what? 5 is $\frac{1}{4}$ of what? 10 is $\frac{1}{4}$ of what? 20 is $\frac{1}{4}$ of what? 25 is $\frac{1}{4}$ of what? 11 is $\frac{1}{4}$ of what? 7 is $\frac{1}{4}$ of what? 9 is $\frac{1}{4}$ of what?

24. 25 is what part of 100? 20 is what part of 80?
1 is what part of 4? 30 is what part of 60?
3 is what part of 12? 25 is what part of 50?

25. Tom had $40 in the bank. He drew out $10. What part of his money did he draw?

26. Mr. King had $5\frac{1}{2}$ pounds of venison. He gave away $\frac{1}{4}$ pound, $\frac{1}{4}$ pound, and $\frac{3}{4}$ pound. How much did he give away? How much did he keep?

27. 1 quart is what part of a gallon? 2 quarts are what part of a gallon? 3 quarts are what part of a gallon?

28. How many quarts are there in $1\frac{1}{4}$ gallons? $1\frac{1}{2}$ gallons? $1\frac{3}{4}$ gallons?

29. A man owned 120 acres of land. He sold $\frac{1}{4}$ of it. How many acres had he left?

30. My brother paid $20 for a bicycle and sold it for $\frac{3}{4}$ of what it cost. For what did he sell it?

31. Fannie went to the country for $\frac{1}{4}$ of a week. How many days was that?

32. At a quarter of a dollar apiece, how many melons will cost $2.00?

33. How much will a dozen 25-cent books cost?

34. How many oranges cut into quarters must I have to give one piece to each of 10 children?

35. How many days will it take a boy to earn $11 if he earns $\$\frac{1}{4}$ each day?

36. What will 5 pounds of candy cost at a quarter a pound?

37. $\frac{1}{4}$ of $32+\frac{3}{4}$ of $48=?$

38. $(5-2\frac{1}{2}-\frac{1}{2})+1\frac{1}{4}=?$

39. $(\frac{1}{2}$ of $70)-(\frac{1}{4}$ of $20)=?$

40. $(5\times\frac{1}{4})-\frac{3}{4}=$how many halves?

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EIGHTHS

1. If each quarter is divided into 2 equal parts, how many parts are there in the whole?

2. What is each part called, when there are eight equal parts in the whole?

3. What are two parts called? Three parts? 5? 7?

4. How many eighths in one-half?

5. How many eighths in $1\frac{1}{2}$? $1\frac{1}{4}$?

6. Three quarters are how many eighths?

7. Change these to eighths: 1, $1\frac{1}{8}$, $1\frac{2}{8}$, $1\frac{1}{4}$, $1\frac{3}{8}$, $1\frac{4}{8}$, $1\frac{2}{4}$, $1\frac{1}{2}$, 2, $2\frac{5}{8}$, $3\frac{3}{8}$, $5\frac{1}{2}$, $\frac{10}{2}$, $\frac{11}{4}$, $2\frac{5}{8}$, $2\frac{1}{8}$, $3\frac{5}{8}$, $5\frac{1}{4}$, $4\frac{1}{2}$, $4\frac{1}{8}$, 5, $1\frac{7}{8}$, $2\frac{7}{8}$, $6\frac{1}{4}$, $3\frac{3}{4}$.

8. How many whole things in these: $\frac{16}{8}$, $\frac{40}{8}$, $\frac{80}{8}$, $\frac{24}{8}$, $\frac{48}{8}$, $\frac{88}{8}$, $\frac{8}{8}$, $\frac{32}{8}$, $\frac{72}{8}$, $\frac{64}{8}$?

9. How many whole things and eighths over in these: $\frac{9}{8}$, $\frac{17}{8}$, $\frac{18}{8}$, $\frac{45}{8}$, $\frac{25}{8}$, $\frac{35}{8}$, $\frac{20}{8}$?

10. Recite the multiplication table of 8's.

11. What is

$\frac{1}{8}$ of 24?
$\frac{2}{8}$ of 24?
$\frac{1}{4}$ of 24?
$\frac{3}{8}$ of 24?
$\frac{4}{8}$ of 24?
$\frac{1}{2}$ of 24?

12. What is

$\frac{2}{4}$ of 24?
$\frac{5}{8}$ of 24?
$\frac{6}{8}$ of 24?
$\frac{3}{4}$ of 24?
$\frac{7}{8}$ of 24?
$\frac{8}{8}$ of 24?

13. What is

$\frac{1}{8}$ of 32?
$\frac{3}{8}$ of 32?
$\frac{1}{8}$ of 40?
$\frac{7}{8}$ of 40?
$\frac{1}{8}$ of 72?
$\frac{5}{8}$ of 96?

14. What is

$\frac{1}{8}$ of 96?
$\frac{2}{8}$ of 96?
$\frac{1}{8}$ of 80?
$\frac{6}{8}$ of 80?
$\frac{1}{8}$ of 48?
$\frac{4}{8}$ of 48?

15.

5 is $\frac{1}{8}$ of what?
4 is $\frac{1}{8}$ of what?
12 is $\frac{1}{8}$ of what?
7 is $\frac{1}{8}$ of what?
6 is $\frac{1}{8}$ of what?

16.

10 is $\frac{1}{8}$ of what?
20 is $\frac{1}{8}$ of what?
25 is $\frac{1}{8}$ of what?
9 is $\frac{1}{8}$ of what?
8 is $\frac{1}{8}$ of what?

17.

12 is what part of 96?
10 is what part of 80?
4 is what part of 32?
20 is what part of 160?
9 is what part of 72?

18.

3 is what part of 24?
8 is what part of 64?
11 is what part of 88?
7 is what part of 56?
2 is what part of 16?

19.

12 is what part of 96?
4 is what part of 32?
9 is what part of 72?
10 is what part of 80?
5 is what part of 40?

20.

3 is $\frac{1}{8}$ of what?
11 is $\frac{1}{8}$ of what?
21 is $\frac{1}{8}$ of what?
30 is $\frac{1}{8}$ of what?
50 is $\frac{1}{8}$ of what?

21. How many pints are there in a gallon?

22. 1 pint is what part of a gallon? 2 pints are what part of a gallon?

23. 3 pints are what part of a gallon? 4 pints are what part of a gallon?

24. 7 pints are what part of a gallon? 5 pints are what part of a gallon?

25. A grocer sold 3 pints from a gallon of vinegar. What part of a gallon was left? What part was sold?

26. Frank was carrying a gallon of oil. He spilled a pint. What part of a gallon remained in the can?

27. $\frac{1}{2}=\frac{}{8}$ $\frac{1}{4}=\frac{}{8}$

28. $\frac{1}{2}+\frac{1}{8}=\frac{}{8}$ $\frac{1}{4}+\frac{1}{8}=\frac{}{8}$

29. $\frac{1}{4}+\frac{2}{8}=\frac{}{8}$ $\frac{3}{4}+\frac{1}{8}=\frac{}{8}$

30. $\frac{1}{2}-\frac{1}{4}-\frac{1}{8}=\frac{}{8}$ $\frac{2}{4}-\frac{1}{4}-\frac{1}{8}=?$

31. Mildred has \$56 in the bank; her sister has $\frac{7}{8}$ as much. How much has her sister?

32. Our baby weighs 12 pounds, which is $\frac{1}{8}$ of what I weigh. How much do I weigh?

33. From Mary's home to the sea is 32 miles. It is $\frac{7}{8}$ as far from her home to the mountains. How far is it to the mountains?

34. Ted's father raised 160 bushels of wheat, and $\frac{3}{8}$ as much barley. How much barley did he raise?

35. A farmer raised 72 horses and sold $\frac{5}{8}$ of them. How many did he sell?

36. Lela bought 48 yards of lace and used $\frac{6}{8}$ of it on a dress. How many yards did she use?

37. Lloyd has read 15 pages, which is $\frac{1}{8}$ of the book. How many pages in the book?

38. I have read 20 pages of a book having 160 pages. What part of the book have I read?

39. After traveling $\frac{7}{8}$ of my journey, I have 9 miles yet to go. How many miles in the whole journey?

40. What part of a whole day from 9 o'clock to 12?

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THIRDS

1. When any whole thing is divided into 3 equal parts, each part is called one-third.

2. 3)15 3)30 3)36 3)12 3)27 3)60

3. When we divide a number by 3, we find $\frac{1}{3}$ of it.

What is $\frac{1}{3}$ of 15?
10 is $\frac{1}{3}$ of what number?
12 is what part of 36?

4. What is $\frac{1}{3}$ of 6? 9? 12? 18? 21? 15? 24? 30? 36? 45?

5. 8 is $\frac{1}{3}$ of what?
11 is $\frac{1}{3}$ of what?
15 is $\frac{1}{3}$ of what?
7 is $\frac{1}{3}$ of what?

6. 9 is $\frac{1}{3}$ of what?
20 is $\frac{1}{3}$ of what?
22 is $\frac{1}{3}$ of what?
12 is $\frac{1}{3}$ of what?

7. 5 is what part of 15?
10 is what part of 30?
9 is what part of 27?
12 is what part of 36?

8. How many feet are there in 1 yd.? Then 1 ft. is what part of a yd.? Two feet are what part of one yard? 3 feet are what part of a yard?

9. 12 inches are what part of a yard? What part of a yard are 24 in.?

10. $\frac{2}{3}$ of 6 = ? $\frac{2}{3}$ of 36 = ? $\frac{2}{3}$ of 90 = ? $\frac{2}{3}$ of 9 = ? $\frac{2}{3}$ of 24 = ? $\frac{2}{3}$ of 99 = ? $\frac{2}{3}$ of 12 = ?

11. $\frac{2}{3}$ of 60 = ? $\frac{2}{3}$ of 66 = ? $\frac{2}{3}$ of 15 = ? $\frac{2}{3}$ of 33 = ? $\frac{2}{3}$ of 72 = ? $\frac{2}{3}$ of 21 = ? $\frac{2}{3}$ of 27 = ?

12. George had \$24 in the bank and drew $\frac{1}{3}$ of it. How much did he draw out?

13. Cecily wishes to make 9 yards of lace. When she has made 6 yards, what part of 9 yards has she made?

14. Charles had a kite string 300 feet long. He lost 100 feet. What part of the string did he lose?

15. A boy had 24 newspapers and sold $\frac{2}{3}$ of them at a cent apiece. How much did he get for them?

16. It is 18 miles to the river. When you have gone 6 miles toward it, what part of the distance have you gone?

17. A farmer raised 150 tons of hay. He sold 50 tons. What part of his crop did he sell?

18. At a cent apiece, what will $\frac{1}{3}$ of 60 oranges cost?

19. Find $\frac{1}{3}$ of 75. What is $\frac{1}{3}$ of 150? $\frac{1}{3}$ of 60? $\frac{1}{3}$ of 54? $\frac{1}{3}$ of 90?

20. Arthur had 75 cents, and paid $\frac{1}{3}$ of it to go to the theatre. How many cents was that? What part of a dollar was it?

21. I had \$75 and deposited $\frac{1}{3}$ of it in the bank. What part did I keep?

22. Mary is $\frac{1}{3}$ as old as her mother. If Mary is 11, how old is her mother?

23. $\frac{1}{3}$ of	**24.** $\frac{1}{3}$ of	**25.** $\frac{1}{3}$ of	**26.** $\frac{1}{3}$ of	**27.** $\frac{1}{3}$ of
21	24	30	45	60
22	25	31	46	61
23	26	32	47	62
28. $\frac{2}{3}$ of	**29.** $\frac{2}{3}$ of	**30.** $\frac{2}{3}$ of	**31.** $\frac{2}{3}$ of	**32.** $\frac{1}{3}$ of
75	36	240	180	50
60	27	270	330	100
45	21	300	360	200

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NINTHS

1. If each one-third be cut into 3 equal pieces, how many pieces will there be in the whole? What is each one of the nine parts called? What are two parts called?

2. Recite the multiplication table of nines.

3. $18 \div 9 = ?$ $36 \div 9 = ?$ $90 \div 9 = ?$ $45 \div 9 = ?$ $54 \div 9 = ?$ $63 \div 9 = ?$

4. What is $\frac{1}{9}$ of 18? Of 27? 36? 45? 72? 63? 54? 99?

5. 6 is $\frac{1}{9}$ of what? 7 is $\frac{1}{9}$ of what? 8 is $\frac{1}{9}$ of what? 9 is $\frac{1}{9}$ of what?

6. 10 is what part of 90? 11 of 99? 9 is what part of 81? 12 of 108?

7. If 9 yards of ribbon cost 90 cents, one yard costs —— of 90 cents, and two yards cost —— of 90 cents or —— cents. Three yards?

8. If 9 pounds of dried fruit cost 108 cents, one pound costs —— of 108 cents, and 5 pounds cost —— of 108 cents. 6 pounds? 8 pounds?

9. What will 7 milk cans hold if 9 cans hold 45 gallons?

10. $\frac{5}{9}$ of $63 = ?$ $\frac{7}{9}$ of $63 = ?$

11. $\frac{7}{9}$ of $54 = ?$ $\frac{4}{9}$ of $54 = ?$

12. $\frac{5}{9}$ of $108 = ?$ $\frac{8}{9}$ of $108 = ?$

13. $\frac{4}{9}$ of $45 = ?$ $\frac{2}{9}$ of $45 = ?$

14. $\frac{8}{9}$ of $99 = ?$ $\frac{7}{9}$ of $99 = ?$

15. $\frac{7}{9}$ of $81 = ?$ $\frac{5}{9}$ of $81 = ?$

16. $\frac{2}{9}$ of $72 = ?$ $\frac{7}{9}$ of $72 = ?$

17. $\frac{4}{9}$ of $27 = ?$ $\frac{8}{9}$ of $27 = ?$

18. $\frac{2}{9}$ of $180 = ?$ $\frac{8}{9}$ of $180 = ?$

19. $\frac{4}{9}$ of $90 = ?$ $\frac{7}{9}$ of $90 = ?$

20. One-third equals how many ninths? Two-thirds equal how many ninths?

21. $\frac{3}{9} = \frac{}{3}$. $\frac{6}{9} = \frac{}{3}$. $\frac{9}{9} = \frac{}{3}$. Find $\frac{3}{9}$ of any number by taking $\frac{1}{3}$ of it; find $\frac{6}{9}$ by taking $\frac{2}{3}$.

22. What is $\frac{3}{9}$ of 18? Of 27? Of 36? Of 45? Of 90? Of 54? Of 72?

23. What is $\frac{3}{9}$ of 33? Of 21? Of 24? Of 30? Of 42? Of 48? Of 60?

24. What is $\frac{6}{9}$ of 9? Of 18? Of 30? Of 27? Of 63? Of 90? Of 81?

25. $\frac{1}{3} + \frac{1}{9} + \frac{1}{9} + \frac{1}{9} =$ how many ninths? How many thirds?

26. $\frac{2}{9} + \frac{5}{9} + \frac{1}{9} - \frac{1}{3} =$ how many ninths?

27. $\frac{9}{9} - \frac{2}{9} = \frac{}{9}$. $1 - \frac{2}{9} = \frac{}{9}$. $2 - \frac{7}{9} = ?$ $\frac{1}{9} + \frac{1}{9} + \frac{1}{9} - \frac{1}{3} = ?$

28. $\frac{1}{9} + \frac{2}{9} + \frac{1}{9} = ?$ $\frac{3}{3} - \frac{3}{9} = ?$ $\frac{8}{9} - \frac{1}{9} = ?$ $\frac{2}{3} - \frac{2}{9} = ?$

29. $\frac{2}{9} + \frac{2}{3} - \frac{1}{9} = ?$ $1 - \frac{3}{9} = \frac{}{9}$, or $\frac{}{3}$. $\frac{4}{9} + \frac{4}{3} = ?$

30. $\frac{18}{9} =$ how many wholes? $\frac{27}{9}$? $\frac{45}{9}$? $\frac{72}{9}$? $\frac{90}{9}$? $\frac{36}{9}$? $\frac{63}{9}$? $\frac{108}{9}$?

31. Change these ninths to wholes: $\frac{36}{9}$, $\frac{54}{9}$, $\frac{63}{9}$, $\frac{81}{9}$, $\frac{99}{9}$, $\frac{108}{9}$.

32. In 2 whole things how many ninths? In 3? In 4? In 10? In 12?

33. Change these wholes to ninths: 4, 6, 7, 8, 9, 11, 10, 5, 3.

34. $9\overline{)10}$. $\frac{10}{9} = 1\frac{1}{9}$.

35. Change these: $\frac{11}{9}$, $\frac{19}{9}$, $\frac{28}{9}$, $\frac{46}{9}$, $\frac{96}{9}$, $\frac{100}{9}$, $\frac{50}{9}$, $\frac{65}{9}$, $\frac{70}{9}$, $\frac{85}{9}$.

36. Change these to ninths: $1\frac{2}{9}$, $1\frac{3}{9}$, $1\frac{4}{9}$, $2\frac{1}{9}$, $2\frac{2}{9}$, $2\frac{8}{9}$, $3\frac{1}{9}$, $3\frac{5}{9}$, $10\frac{1}{9}$.

37. $\frac{1}{9}$ of a farmer's crop of hay was 10 tons. What was his entire crop?

38. If he sold $\frac{7}{9}$ of his crop, how many tons did he sell?

39. This represents 9 sq. ft., or 1 sq. yd. 1 sq. ft. is what part of a square yard? 2 sq. ft. are what part?

40. In 18 sq. ft. how many square yards?

41. How many square feet in 3 sq. yds.?

42. How many square feet in 4 sq. yds.?

43. In 33 sq. ft. how many square yards?

44. The floor of my closet contains 27 sq. ft. How many square yards in it?

45. The floor of my bedroom contains 180 sq. ft. How many square yards of carpet will cover it?

46. The top of mother's dining table contains 36 sq. ft. How many square yards?

47. A certain rug contains 20 sq. ft. How many square yards?

48. Another rug contains 5 sq. yd. How many square feet?

49. The ceiling of a certain room contains $5\frac{5}{9}$ sq. yd. How many square feet?

50. Our front porch was painted yesterday. The painter told me it cost my father $10.80, which was 10 cents a square foot. How many square yards in it?

51. Our sidewalk has 270 sq. ft. of cement in it. How many square yards is that?

52. 3 sq. yd. 27 sq. ft. are how many square yards? 18 sq. ft. 27 sq. ft. are how many square yards?

53. 20 is what part of 180? 30 of 270? 13 of 117?

54. 40 is $\frac{1}{9}$ of what? 14 is $\frac{1}{9}$ of what? 15 is $\frac{1}{9}$ of what?

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SIXTHS AND TWELFTHS

1. If one-half be divided into 3 equal parts, how many parts will there be in the whole? What is one part called? What are 2 parts called? 3? 4? 5?

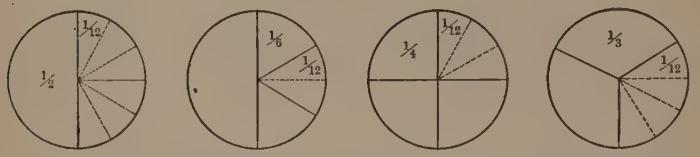
2. If each third be divided into 2 equal parts, how many parts will there be in the whole? What is one part called? What are 4 parts called? 5?

3. Then $\frac{1}{2}$ is how many sixths? $\frac{1}{3}$ is how many sixths?

4. $\frac{2}{6} = \frac{}{3}$. $\frac{4}{6} = \frac{}{3}$. $\frac{3}{6} = \frac{}{2}$.

5. $\frac{1}{2} + \frac{1}{6} = \frac{}{6}$. $\frac{1}{2} + \frac{1}{3} = \frac{}{6}$. $\frac{1}{2} + \frac{1}{3} + \frac{1}{6} = ?$ $\frac{1}{3} + \frac{1}{6} = \frac{}{6}$. $\frac{2}{6} + \frac{2}{3} = ?$ $\frac{1}{2} + \frac{1}{6} = \frac{}{3}$.

6.



I. Dividing halves into twelfths. II. Dividing sixths into twelfths. III. Dividing fourths into twelfths. IV. Dividing thirds into twelfths.

7. $\frac{1}{2} = \frac{}{12}$. $\frac{1}{3} = \frac{}{12}$. $\frac{1}{6} = \frac{}{12}$.

8. $\frac{1}{2} + \frac{1}{12} = \frac{}{12}$. $\frac{1}{4} + \frac{1}{12} = \frac{}{12}$. $\frac{1}{2} - \frac{1}{12} = \frac{}{12}$. $\frac{1}{4} - \frac{1}{12} = \frac{}{12}$.

9. $\frac{1}{6} + \frac{1}{12} = \frac{}{12}$. $\frac{1}{3} + \frac{1}{12} = \frac{}{12}$. $\frac{1}{6} - \frac{1}{12} = \frac{}{12}$. $\frac{1}{3} - \frac{1}{12} = \frac{}{12}$.

10. $\frac{2}{12} = ?$ $\frac{3}{12} = ?$ $\frac{4}{12} = ?$ $\frac{6}{12} = ?$

11. The easiest way to find $\frac{2}{12}$ of any number is to find $\frac{1}{?}$ of it.

12. The easiest way to find $\frac{3}{12}$ of any number is to find $\frac{1}{?}$ of it.

13. The easiest way to find $\frac{4}{12}$ of any number is to find $\frac{1}{?}$ of it.

14. The easiest way to find $\frac{6}{12}$ of any number is to find $\frac{1}{?}$ of it.

15. $\frac{2}{12}$ of	**16.** $\frac{2}{12}$ of	**17.** $\frac{3}{12}$ of	**18.** $\frac{3}{12}$ of	**19.** $\frac{4}{12}$ of	**20.** $\frac{4}{12}$ of
6	36	40	8	30	9
12	60	16	44	33	27
18	30	24	48	21	36

21. $\frac{6}{12}$ of 10	**22.** $\frac{6}{12}$ of 40	**23.** $\frac{1}{12}$ of 36	**24.** $\frac{1}{12}$ of 132
20	50	60	144
25	70	108	120
25. $\frac{5}{12}$ of 54	**26.** $\frac{7}{12}$ of 12	**27.** $\frac{11}{12}$ of 72	**28.** $\frac{11}{12}$ of 108
48	60	84	132
72	120	96	60
29. $\frac{5}{12}$ of 84	**30.** $\frac{7}{12}$ of 108	**31.** $\frac{1}{9}$ of 37	**32.** $\frac{1}{12}$ of 37
96	132	45	49
108	144	73	73

33. If four-twelfths $= \frac{1}{3}$, eight-twelfths are how many thirds? What is the easiest way to find $\frac{8}{12}$ of a number?

34. What is $\frac{8}{12}$ of 30? 36? 48? 60? 108? 96? 84? 72? 21? 24? 27?

35. Since $\frac{3}{12} = \frac{1}{4}$, $\frac{9}{12} = \frac{?}{4}$. What is the easiest way to find $\frac{9}{12}$ of any number?

36. Find $\frac{9}{12}$ of 24, 16, 40, 96, 44, 60, 36, 48, 20, 12.

37. There are how many 12ths in $\frac{1}{6}$? There are how many 12ths in $\frac{5}{6}$?

38. Find in the easiest way $\frac{10}{12}$ of these numbers: 24, 30, 36, 48, 60.

39. There were 24 blossoms on John's magnolia tree, and he picked $\frac{7}{12}$ of them. How many did he pick?

40. How many would he have picked had he picked $\frac{7}{8}$ of them? $\frac{5}{6}$? $\frac{3}{4}$?

41. The cook had three dozen each of oranges and lemons. She used $\frac{5}{6}$ of the oranges and $\frac{5}{12}$ of the lemons. How many of each did she use?

42. Suppose she had used $\frac{3}{4}$ of each, how many would she have used?

43. If she had used $\frac{2}{3}$ of the oranges and $\frac{2}{9}$ of the lemons, how many would she have used of each?

44. A farmer raised 48 bushels each of wheat, corn, barley, oats, potatoes, and walnuts. He sold $\frac{1}{2}$ of his barley, $\frac{1}{3}$ of his oats, $\frac{1}{4}$ of his potatoes, and $\frac{1}{12}$ of his walnuts. How many bushels of each did he sell?

45. The farmer raised 60 turkeys, 240 chickens, and 75 geese. He took to market at Thanksgiving $\frac{5}{12}$ of his turkeys, $\frac{1}{6}$ of his chickens, and $\frac{1}{3}$ of his geese. How many did he take of each?

46. A man sold $\frac{1}{12}$ of his land to one man, $\frac{1}{3}$ to another, and $\frac{1}{4}$ to another. What part of all his land had he sold then?

47. A boy bought 18 *Suns* and 18 *Posts*. He sold $\frac{5}{6}$ of the *Suns* and $\frac{5}{9}$ of the *Posts*. How many did he sell of each?

48. I had a box of 60 oranges and gave away 20. What part did I give away? How many sixths was that? How many 12ths?

49. I ate 6 apples, which were $\frac{1}{12}$ of the number I bought. How many did I buy?

50. Roland sold 9 baskets of fruit this morning. This was $\frac{4}{12}$ of what he sold yesterday. How many baskets did he sell yesterday?

51. $\frac{3}{12}$ of my brother's age is 6 years. How old is he?

52. I am $\frac{5}{12}$ as old. How old am I?

53. My mother weighs 144 pounds. I weigh $\frac{7}{12}$ as much. How much do I weigh?

54. $\frac{60}{12}=?$ $\frac{48}{12}=?$ $\frac{75}{12}=?$ $\frac{100}{12}=?$ $\frac{48}{6}=?$ $\frac{50}{6}=?$ $\frac{50}{12}=?$ $\frac{17}{12}=?$ $\frac{17}{6}=?$ $\frac{21}{6}=?$

55. $5\frac{1}{12}=?$ $3\frac{1}{3}=\frac{?}{12}$. $10\frac{1}{12}=?$ $10\frac{1}{2}=\frac{?}{12}$. $3\frac{1}{4}=\frac{}{12}$. $6\frac{1}{6}=\frac{}{12}$. $2\frac{1}{2}=\frac{}{12}$. $9\frac{11}{12}=?$

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FIFTHS AND TENTHS

1. Into how many parts has any thing or number been divided if one part is one-fifth?

2. If each fifth be divided into two parts, what will one of the parts then be called?

3. $\frac{1}{5} = \frac{}{10}$. $\frac{2}{5} = \frac{}{10}$. $\frac{3}{5} = \frac{}{10}$. $\frac{4}{5} = \frac{}{10}$. $\frac{1}{5} - \frac{1}{10} = ?$ $\frac{4}{5} - \frac{1}{10} = ?$

4. $1\frac{1}{5} = \frac{}{5} = \frac{}{10}$. $2\frac{3}{5} = \frac{}{5} = \frac{}{10}$. $1\frac{1}{5} - \frac{2}{5} = ?$ $1\frac{1}{5} - \frac{3}{10} = ?$

5. $\frac{2}{5} + \frac{3}{10} = \frac{}{10}$. $\frac{1}{5} + \frac{3}{10} + \frac{1}{2} = \frac{}{10}$. $\frac{2}{5} - \frac{3}{10} = ?$ $\frac{9}{10} - \frac{4}{5} = ?$

6. $\frac{1}{5}$ of $15 = ?$ $25 = ?$ $35 = ?$

7. $\frac{1}{5}$ of $45 = ?$ $55 = ?$ $5 = ?$

8. $\frac{1}{5}$ of $10 = ?$ $20 = ?$ $30 = ?$

9. $\frac{1}{5}$ of $40 = ?$ $50 = ?$ $60 = ?$

10. $\frac{3}{5}$ of $30 = ?$ $\frac{2}{5}$ of $45 = ?$ $\frac{4}{5}$ of $60 = ?$ $\frac{3}{5}$ of $40 = ?$

11. $\frac{7}{10}$ of $50 = ?$ $\frac{3}{10}$ of $100 = ?$ $\frac{9}{10}$ of $1000 = ?$ $\frac{3}{10}$ of $90 = ?$

12. 11 is $\frac{1}{10}$ of what? 9 is $\frac{1}{5}$ of what? 8 is $\frac{5}{10}$ of what? 12 is $\frac{1}{10}$ of what?

13. 5 is what part of 50? Of 25? 9 is what part of 45? Of 90?

14.
$\frac{1}{10}$ of $\$1 = ?$
$\frac{1}{5}$ of $\$1 = ?$
$\frac{3}{10}$ of $\$1 = ?$
$\frac{2}{5}$ of $\$1 = ?$
$\frac{1}{2}$ of $\$1 = ?$
$\frac{3}{5}$ of $\$1 = ?$
$\frac{7}{10}$ of $\$1 = ?$
$\frac{4}{5}$ of $\$1 = ?$
$\frac{9}{10}$ of $\$1 = ?$

15.
What part of $\$1$ are 10 cents?
What part of $\$1$ are 20 cents?
What part of $\$1$ are 50 cents?
What part of $\$1$ are 90 cents?
What part of $\$1$ are 70 cents?
What part of $\$1$ are 75 cents?
What part of $\$1$ are 80 cents?
What part of $\$1$ are 60 cents?
What part of $\$1$ are 40 cents?

16. I bought a bill of goods and the merchant threw off $2.50, which was $\frac{1}{10}$ of the bill. What was the bill?

17. After paying $\frac{4}{5}$ of the price of my bicycle, I had $10 yet to pay. What was the cost of the wheel?

18. I paid $5 for 10 photographs. How much was that apiece?

19. $\frac{4}{5}$ of your money is $\frac{1}{10}$ of mine. Your money is $50. What is mine?

20. $\frac{9}{10}$ of your money is $\frac{1}{5}$ of mine. My money is $450. What is yours?

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1. Here are three ways of writing the same example:

I and II are called Division, as you know.
III is also division, but we call it a Fraction.

I	II	III
$5\overline{)10}$ 2	$10 \div 5 = 2$	$\frac{10}{5} = 2$

2. Notice that the dividend 10 is placed above the line. It is called the *nu-mer-a-tor*. The divisor is placed below the line. Its name is *de-nom-i-na-tor*. (Learn to spell these words.)

3. Re-write and re-read these examples as fractions:

$5 \div 2 = \frac{5}{2}$ $1 \div 2 =$ $6 \div 3 =$ $3 \div 6 =$ $5 \div 10 =$ $10 \div 20 =$
$12 \div 3 =$ $12 \div 4 =$ $3 \div 12 =$ $4 \div 12 =$ $3 \div 9 =$ $5 \div 20 =$

Re-write and re-read these fractions as examples in division

4. $\frac{3}{4}=3\div4$ $\frac{7}{8}=7\div8$ $\frac{5}{6}=5\div6$ $\frac{25}{5}$ $\frac{24}{3}$ $\frac{21}{10}$ $\frac{18}{6}$

5. $\frac{5}{9}$ $\frac{9}{10}$ $\frac{15}{3}$ $\frac{3}{7}$ $\frac{21}{10}$ $\frac{17}{5}$ $\frac{30}{12}$

6. $\frac{12}{6}$ $\frac{27}{9}$ $\frac{3}{15}$ $\frac{4}{10}$ $\frac{5}{8}$ $\frac{2}{3}$ $\frac{11}{5}$

7. $\frac{10}{20}$ $\frac{4}{2}$ $\frac{27}{12}$ $\frac{10}{11}$ $\frac{1}{3}$ $\frac{20}{10}$ $\frac{2}{4}$

8. Re-write above examples, using the curved line to separate divisor and dividend.

Write the following examples in three different ways:

9	10	11
Divide 16 by 4	Divide 15 by 4	24 divided by 2
Divide 20 by 5	Divide 20 by 7	35 divided by 6
Divide 28 by 4	Divide 27 by 9	33 divided by 12
Divide 30 by 10	Divide 31 by 10	72 divided by 12
Divide 36 by 9	Divide 35 by 9	80 divided by 10

12. Read these as examples in division: $\frac{4}{7}$, $\frac{14}{7}$, $\frac{7}{14}$, $\frac{7}{4}$, $\frac{18}{9}$, $\frac{9}{18}$, $\frac{8}{9}$, $\frac{9}{8}$, $\frac{24}{12}$, $\frac{12}{24}$, $\frac{4}{4}$, $\frac{31}{12}$, $\frac{10}{31}$, $\frac{10}{3}$, $\frac{3}{10}$, $\frac{36}{4}$, $\frac{36}{9}$, $\frac{36}{12}$, $\frac{36}{6}$, $\frac{36}{2}$, $\frac{36}{3}$, $\frac{36}{5}$, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{10}$, $\frac{2}{10}$.

13. Tell which is the denominator, or divisor, in each fraction in Nos. 4, 5, 6, 7, and 12.

14. Tell which is the numerator, or dividend, in the same.

15. Select all the fractions in Nos. 4, 5, 6, 7, and 12 having the denominator larger than the numerator.

16. These fractions are called proper fractions. Read thoughtfully now, and you will understand why. You have seen that a fraction is really an example in division. When we divide any thing or number, we take *part* of it. You know that we usually speak of a part of anything as meaning less than the whole, as: Give me *part* of your orange; He sold *part* of his farm. Therefore, those fractions that

are less than one whole thing, or unit, are, properly speaking, fractions, and we call them *proper fractions*. (If you do not understand this, read again.) Which of these are proper fractions : $\frac{10}{2}$, $\frac{10}{5}$, $\frac{2}{10}$, $\frac{3}{12}$, $\frac{5}{10}$, $\frac{14}{3}$, $\frac{10}{9}$, $\frac{9}{10}$, $\frac{4}{5}$?

17. Go over Nos. 4, 5, 6, and 7 again and select the proper fractions.

18. Make twenty proper fractions.

19. Now, fractions that represent a whole thing or more than a whole thing are also fractions, for they indicate or show division; so we call them *im-proper fractions*. (*Im* means *not*, as : *im-pure*, *im-modest*.)

20. Select the improper fractions in Nos. 4, 5, 6, 7, and 12.

21. Make twenty more improper fractions.

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1. Change these improper fractions to whole numbers: $\frac{15}{3}$, $\frac{15}{5}$, $\frac{21}{3}$, $\frac{21}{7}$, $\frac{27}{9}$, $\frac{30}{3}$, $\frac{30}{10}$, $\frac{30}{5}$, $\frac{30}{6}$, $\frac{36}{2}$, $\frac{36}{3}$, $\frac{36}{4}$, $\frac{36}{6}$, $\frac{36}{9}$, $\frac{36}{12}$, $\frac{36}{18}$, $\frac{35}{5}$, $\frac{35}{7}$, $\frac{24}{12}$, $\frac{24}{8}$, $\frac{24}{3}$, $\frac{24}{2}$, $\frac{25}{5}$, $\frac{49}{7}$, $\frac{64}{8}$, $\frac{81}{9}$, $\frac{108}{12}$, $\frac{84}{12}$, $\frac{96}{12}$, $\frac{132}{12}$, $\frac{121}{11}$, $\frac{144}{12}$, $\frac{180}{20}$, $\frac{200}{100}$, $\frac{1000}{500}$, $\frac{1000}{200}$, $\frac{1000}{2}$, $\frac{1000}{5}$, $\frac{500}{50}$, $\frac{500}{100}$, $\frac{500}{5}$, $\frac{500}{25}$, $\frac{500}{4}$, $\frac{100}{4}$, $\frac{100}{25}$, $\frac{100}{20}$, $\frac{875}{175}$, $\frac{600}{120}$, $\frac{625}{125}$.

2. When a whole number and a fraction are used together to make one number, the number is called a mixed number, as: $1\frac{1}{2}$, $2\frac{1}{4}$, $3\frac{2}{5}$.

3. $1\frac{1}{2}=\frac{3}{2}$	**4.** $7\frac{1}{2}=$	**5.** $1\frac{1}{3}=\frac{4}{3}$	**6.** $3\frac{2}{3}=$	**7.** $1\frac{1}{4}=$	**8.** $2\frac{3}{4}=$
$2\frac{1}{2}=$	$10\frac{1}{2}=$	$1\frac{2}{3}=$	$5\frac{1}{3}=$	$1\frac{2}{4}=$	$6\frac{1}{4}=$
$3\frac{1}{2}=$	$12\frac{1}{2}=$	$2\frac{1}{3}=$	$10\frac{2}{3}=$	$1\frac{3}{4}=$	$7\frac{2}{4}=$
$4\frac{1}{2}=$	$20\frac{1}{2}=$	$2\frac{2}{3}=$	$33\frac{1}{3}=$	$2\frac{1}{4}=$	$8\frac{3}{4}=$
$5\frac{1}{2}=$	$25\frac{1}{2}=$	$3\frac{1}{3}=$	$40\frac{2}{3}=$	$2\frac{2}{4}=$	$12\frac{3}{4}=$

9. Change $4\frac{2}{5}$ to an improper fraction. Since in 1 there are 5 fifths, in 4 there are 4×5 fifths, or 20 fifths, plus 2 fifths, are 22 fifths, written $\frac{22}{5}$.

Analyze:

10. $3\frac{4}{5}$ are how many fifths?

11. $7\frac{1}{5}$ are how many fifths?

12. $8\frac{2}{6}$ are how many sixths?

13. $9\frac{5}{6}$ are how many sixths?

14. $4\frac{2}{7}$ are how many sevenths?

15. $5\frac{5}{7}$ are how many sevenths?

16. $9\frac{5}{8}$ are how many eighths?

17. $4\frac{4}{9}$ are how many ninths?

18. $7\frac{8}{9}$ are how many ninths?

19. $5\frac{3}{10}$ are how many tenths?

20. $7\frac{5}{10}$ are how many tenths?

21. $8\frac{2}{7}$ are how many sevenths?

Reduce (change) to improper fractions:

22. $10\frac{3}{8}$	**23.** $5\frac{11}{12}$	**24.** $7\frac{3}{5}$	**25.** $8\frac{5}{6}$	**26.** $7\frac{2}{3}$	**27.** $30\frac{2}{5}$	**28.** $12\frac{1}{2}$
$6\frac{4}{9}$	$11\frac{2}{3}$	$15\frac{1}{2}$	$41\frac{5}{10}$	$12\frac{4}{10}$	$10\frac{5}{8}$	$6\frac{1}{4}$
$20\frac{2}{3}$	$50\frac{1}{2}$	$9\frac{3}{4}$	$8\frac{2}{3}$	$21\frac{1}{4}$	$50\frac{1}{3}$	$14\frac{2}{7}$
$10\frac{3}{5}$	$12\frac{9}{10}$	$23\frac{3}{4}$	$50\frac{1}{4}$	$16\frac{1}{2}$	$33\frac{1}{3}$	$6\frac{2}{3}$

29. Do you see that, in changing a mixed number to an improper fraction, the denominator remains the same? Do you see that we get the new numerator by multiplying the denominator by the whole number and then adding the numerator? As: $5\frac{1}{12}$ are how many twelfths? 5×12 twelfths are 60 twelfths, plus 11 twelfths, are 71 twelfths, $\frac{71}{12}$.

$7\frac{3}{10} = \frac{?}{10}$. $\quad 7 \times 10, + 3 = 73$. Therefore, $7\frac{3}{10} = \frac{73}{10}$.

30. Change these mixed numbers to improper fractions as explained in No. 29:

$2\frac{3}{13}$ ($2 \times 13, +3 =$ numerator.) $1\frac{9}{14}$, $4\frac{4}{15}$, $2\frac{9}{16}$, $2\frac{10}{24}$, $3\frac{3}{20}$, $5\frac{7}{20}$, $4\frac{2}{25}$, $3\frac{10}{25}$, $4\frac{1}{30}$, $10\frac{5}{35}$, $12\frac{9}{30}$, $1\frac{11}{12}$, $2\frac{3}{24}$, $5\frac{5}{30}$, $30\frac{3}{5}$, $15\frac{3}{5}$, $1\frac{12}{25}$, $9\frac{1}{9}$.

31. Change these mixed numbers to improper fractions:

$5\frac{2}{3}$	$3\frac{1}{4}$	$6\frac{1}{2}$	$3\frac{4}{5}$	$8\frac{2}{9}$	$6\frac{2}{3}$	$3\frac{2}{4}$	$6\frac{1}{3}$	$4\frac{4}{5}$
$8\frac{2}{7}$	$7\frac{2}{3}$	$3\frac{3}{4}$	$6\frac{2}{3}$	$5\frac{4}{5}$	$8\frac{2}{11}$	$4\frac{2}{3}$	$3\frac{4}{5}$	$6\frac{1}{4}$
$6\frac{4}{5}$	$8\frac{3}{5}$	$3\frac{2}{3}$	$3\frac{3}{5}$	$6\frac{3}{4}$	$7\frac{4}{5}$	$8\frac{3}{8}$	$9\frac{5}{9}$	$2\frac{2}{7}$

32. Change these improper fractions to whole or mixed numbers. (Remember they are examples in division.)

$\frac{15}{3}$, $\frac{16}{3}$, $\frac{24}{8}$, $\frac{26}{8}$, $\frac{33}{10}$, $\frac{40}{12}$, $\frac{49}{12}$, $\frac{20}{3}$, $\frac{32}{3}$, $\frac{32}{4}$, $\frac{33}{8}$, $\frac{27}{9}$, $\frac{27}{7}$, $\frac{27}{8}$, $\frac{34}{11}$, $\frac{40}{11}$, $\frac{44}{11}$, $\frac{48}{11}$, $\frac{121}{11}$, $\frac{120}{11}$, $\frac{144}{12}$, $\frac{71}{10}$, $\frac{85}{10}$, $\frac{90}{10}$, $\frac{90}{10}$, $\frac{90}{11}$, $\frac{100}{12}$, $\frac{100}{11}$, $\frac{100}{20}$, $\frac{125}{20}$, $\frac{150}{50}$, $\frac{153}{50}$, $\frac{100}{9}$.

144

1. What is a fraction? The number below the line is the ——. The number above the line is the ——. These are called the terms of the fraction. The —— is the divisor. The —— is the dividend.

2. What is a proper fraction? What is an improper fraction?

3. What is a mixed number?

4. Another name for *whole number* is *integer*. Use *integer* hereafter.

How do you change an improper fraction to an integer or mixed number?

5. How do you change a mixed number to an improper fraction?

6. Write 10 integers that can be divided by 2 without a remainder.

Let us write this in another way that means just the same: Write 10 integers exactly divisible by 2. Use these new words hereafter.

7. Give all the numbers between 20 and 50 that are exactly divisible by 2. Between 80 and 100.

8. Numbers exactly divisible by 2 are called *even* numbers. Give the even numbers from 50 to 70.

9. Give the numbers below 30 that are not even.

10. All numbers not *even* are *odd*.
Give the odd numbers from 30 to 60.

11. Give the numbers to 36 that are exactly divisible by 3.

12. I wish to use another word which may be new to you. It is *digit*. The number 12 has two digits, 1 and 2. 15 has two digits, 1 and 5.

13. Notice the numbers you gave in No. 11: 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, and 36. Notice that the sum of the digits in the number 12 ($1 + 2 = 3$) is exactly divisible by 3. 15 ($1 + 5 = 6$), 18 ($1 + 8 = 9$). Is it true of 21, 24, 27, and the others?

14. It is true of all numbers, however large, that if the sum of the digits be exactly divisible by 3, the number is exactly divisible by 3.

Tell by the test given above, which of these numbers are exactly divisible by 3: 39, 60, 120, 150, 312, 453, 762, 513, 75, 705, 7005, 111.

15. Make ten more numbers exactly divisible by 3.

16. Give the numbers from 36 to 72 that are exactly divisible by 3.

17. What is an integer? What is a digit?

18. What does *exactly divisible* mean?

19. What are even numbers? What are odd numbers?

20. What numbers are exactly divisible by 2?

21. Describe numbers exactly divisible by 3.

145

1. Here is another new word. A number that will exactly divide another number is called a *factor* of that number.

2. Give a factor of 6. Another. Give a factor of 9. Of 14. Of 21. Give five factors of 12, six factors of 24, six of 36, seven of 48, four of 50.

3. The factors that, multiplied together, will produce a given number are called a set of factors, as: one set of factors of 12 is 3 and 4, another set of factors is 2 and 6.

4. Give two sets of factors of 18. Give three sets of factors of 24.

5. Give three sets of factors of 30. Give three sets of factors of 100.

6. Give all the sets of two factors of these numbers: 32, 35, 60, 64, 21, 28, 48, 56.

7. Give five numbers that have 2 for one factor.

8. Give five that have 2 and 3 and another.

9. Give five that have 5 for one factor.

10. All numbers that contain 5 as a factor end in either — or —. All numbers having the factor 10 end in ——.

11. Give ten numbers containing 9 as a factor. Add the digits composing each of the numbers, and you will see that each sum is exactly divisible by 9. This is true of all numbers divisible by 9.

12. Tell by looking at these numbers which are exactly divisible by 9: 342, 217, 81, 103, 801, 810, 108, 180, 54, 504, 405, 540, 450, 700, 702, 315, 245, 713, 711.

13. Make ten more numbers exactly divisible by 9.

14. Numbers like 1, 2, 3, 5, 11, 13, that have no factors but themselves and 1, are called *prime* numbers. So here you have another new word. Give the prime numbers from 13 to 30. Give the prime numbers from 20 to 40. From 40 to 50. From 50 to 75, 75 to 100.

15. In deciding whether or not a number is prime, you must examine it with care. There are many more that are not prime than there are prime. Those that are not prime are called *com-pos-ite*.

16. Give the composite numbers below 25. Below 50. Below 75. Below 100.

17. Give prime factors of these numbers:

4=2, 2	9=3, 3	14=2, 7	18=2, 3, 3	22=2, 11	26
6	10	15	20	24	27
8	12	16	21	25	28

18. Give prime factors of: 30, 32, 33, 34, 35, 36, 38, 39, 40, 42, 44, 45.

19. Give prime factors of each composite number from 45 to 55.

20. Give the prime factors of the next 10 composite numbers above 55.

21. Give prime factors of 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80.

22. You should make yourself very familiar with factors. Go on with numbers to 100 or farther if you can.

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1. What is a factor?

2. What is a prime number? What is a prime factor?

3. What is a composite number? How many prime numbers are there below 100?

4. Describe numbers exactly divisible by 5. By 3. By 9. Use 2, 5, and 3 as factors; as digits. Use 3, 3, and 5 as factors; as digits.

5. What factor is found in both 10 and 15? 12 and 15? 21 and 35? A factor that is found in each one of two or more numbers is said to be a *common factor* of those numbers.

6. Give a common factor of:

12, 24, and 36.	21, 28, and 35.	16 and 20.
15, 25, and 30.	18, 21, and 24.	20 and 24.

7. Give the largest number that is a common factor in the sets of numbers above. Such a factor is called the *greatest common factor*, written g. c. f., or sometimes g. c. d., meaning, *greatest common divisor*.

8. g. c. f. of 18, 27, 36	9. g. c. f. of 35, 42, 49
10. g. c. f. of 30, 60, 70	11. g. c. f. of 55, 65, 95
12. g. c. f. of 33, 66, 88	13. g. c. f. of 108, 132, 144
14. g. c. f. of 25, 50, 75, 100	15. g. c. f. of 40, 60, 80, 100
16. g. c. f. of 54, 63, 81, 99	17. g. c. f. of 15, 30, 60, 75
18. g. c. f. of 17 and 51	19. g. c. f. of 14 and 42
20. g. c. f. of 30 and 41	21. g. c. f. of 18 and 24
22. g. c. f. of 19 and 38	23. g. c. f. of 9 and 11
24. g. c. f. of 16 and 78	25. g. c. f. of 15 and 21

26. g. c. f. of 16 and 27

27. g. c. f. of 14 and 28

28. g. c. f. of 16 and 48

29. g. c. f. of 13 and 17

30. g. c. f. of 21 and 27

31. g. c. f. of 21 and 24

32. g. c. f. of 21 and 28

33. g. c. f. of 21 and 29

34. g. c. f. of 21 and 81

35. g. c. f. of 13 and 117

147

1. What are the terms of a fraction?

2. What is a common factor?

3. What is the greatest common factor of two or more numbers?

4. Does changing $\frac{4}{8}$ to $\frac{1}{2}$ change the value of the fraction? Is $\frac{2}{4}$ of an apple just as much as $\frac{4}{8}$ of an apple? Will $\frac{1}{2}$ of a dollar buy as much as $\frac{2}{4}$ of a dollar?

5. This changing the terms of a fraction to smaller numbers without changing the value of the fraction, is called changing to lower or to lowest terms.

6. Change these fractions to their lowest terms by dividing both terms by their greatest common factor:

$\frac{5}{10}$	$\frac{3}{12}$	$\frac{3}{15}$	$\frac{9}{15}$	$\frac{12}{24}$	$\frac{24}{36}$	$\frac{12}{36}$	$\frac{27}{36}$	$\frac{5}{30}$	$\frac{18}{30}$
$\frac{3}{6}$	$\frac{9}{12}$	$\frac{5}{15}$	$\frac{8}{24}$	$\frac{8}{24}$	$\frac{6}{36}$	$\frac{18}{36}$	$\frac{28}{36}$	$\frac{15}{30}$	$\frac{15}{40}$
$\frac{6}{12}$	$\frac{4}{12}$	$\frac{10}{15}$	$\frac{6}{24}$	$\frac{2}{24}$	$\frac{4}{36}$	$\frac{3}{36}$	$\frac{10}{36}$	$\frac{25}{30}$	$\frac{27}{30}$
$\frac{6}{9}$	$\frac{8}{12}$	$\frac{12}{15}$	$\frac{9}{24}$	$\frac{5}{25}$	$\frac{9}{36}$	$\frac{21}{36}$	$\frac{20}{30}$	$\frac{24}{30}$	$\frac{28}{30}$

7. Change to lowest terms: $\frac{36}{60}$, $\frac{60}{72}$, $\frac{36}{72}$, $\frac{18}{72}$, $\frac{18}{60}$, $\frac{18}{63}$, $\frac{36}{63}$, $\frac{18}{27}$, $\frac{63}{72}$, $\frac{63}{81}$, $\frac{72}{81}$, $\frac{72}{84}$, $\frac{72}{96}$, $\frac{72}{108}$, $\frac{84}{96}$, $\frac{84}{108}$, $\frac{96}{108}$, $\frac{35}{45}$, $\frac{45}{65}$, $\frac{35}{55}$, $\frac{35}{65}$, $\frac{45}{55}$, $\frac{108}{132}$, $\frac{108}{144}$, $\frac{108}{120}$, $\frac{120}{132}$, $\frac{120}{144}$, $\frac{45}{54}$, $\frac{45}{96}$, $\frac{45}{108}$, $\frac{36}{45}$, $\frac{36}{50}$, $\frac{60}{96}$, $\frac{60}{108}$, $\frac{84}{144}$, $\frac{25}{30}$, $\frac{25}{75}$, $\frac{25}{80}$, $\frac{25}{70}$, $\frac{25}{90}$, $\frac{63}{81}$, $\frac{63}{121}$, $\frac{120}{124}$, $\frac{125}{300}$.

8. Read g. c. f.

13, 26, 39	39, 42	99, 121, 110	49, 63, 84
28, 42	50, 75, 100	111, 121, 132	54, 90, 120

9. Reduce to lowest terms: $\frac{28}{42}$, $\frac{39}{42}$, $\frac{13}{26}$, $\frac{13}{39}$, $\frac{26}{39}$, $\frac{50}{75}$, $\frac{500}{100}$, $\frac{75}{100}$, $\frac{49}{63}$, $\frac{49}{84}$, $\frac{63}{84}$, $\frac{54}{90}$, $\frac{54}{120}$, $\frac{54}{108}$, $\frac{90}{120}$, $\frac{110}{121}$, $\frac{39}{40}$, $\frac{15}{17}$, $\frac{15}{65}$, $\frac{15}{70}$, $\frac{1}{100}$, $\frac{17}{51}$, $\frac{19}{57}$, $\frac{14}{56}$, $\frac{16}{64}$, $\frac{16}{96}$, $\frac{18}{54}$, $\frac{19}{76}$, $\frac{16}{78}$, $\frac{13}{39}$, $\frac{13}{15}$, $\frac{14}{100}$, $\frac{19}{100}$.

10. Make five fractions which you reduce to lowest terms by dividing both terms by 12.

11. Make 5 fractions, the g. c. f. of whose numerator and denominator is 6.

12. When are fractions in their lowest terms?

148

1. I have two pieces of land containing respectively 56 and 64 acres. What is the largest-sized lot into which I can divide these two pieces and have the lots of uniform size?

2. A farmer has 72 bushels of oats, 96 bushels of barley, 60 bushels of corn, and 108 bushels of wheat. He wishes to put his grain in bins of uniform size. What is the largest-sized bin that will enable him to do this?

3. A merchant has three pieces of silk containing respectively 14 yards, 35 yards, and 84 yards. He wishes to cut them into uniform lengths. What is the longest possible length?

4. A grocer has 50 lbs. of rice and 72 lbs. of tapioca. He wishes to put them in equal parcels. What is the largest-sized parcel into which he may put them?

5. An orchardist has 27 lemon and 36 orange trees to plant. How many trees must he put in a row so that he will have the same number of rows of each?

149

1. It is often necessary to change fractions to higher terms.

$\frac{1}{2}=\frac{2}{4}$ $\frac{2}{4}=\frac{4}{8}$ $\frac{1}{3}=\frac{2}{6}$ $\frac{2}{6}=\frac{4}{12}$ $\frac{1}{3}=\frac{3}{9}$ $\frac{1}{5}=\frac{2}{10}$ $\frac{2}{3}=\frac{8}{12}$

You see this can be done without changing the value of the fractions. When we changed to lower terms, we were careful to *divide* both numerator and denominator by the *same* number.

When we change to higher terms, we must be careful to *multiply* both numerator and denominator by the *same* number, so as not to change the value of the fraction.

2. Change to twelfths:

$\frac{2\times4}{3\times4}=\frac{8}{12}$ $\frac{3}{4}=\frac{}{12}$ $\frac{1}{2}=\frac{}{12}$ $\frac{5}{6}=\frac{}{12}$ $\frac{1}{3}=\frac{}{12}$ $\frac{2}{3}=\frac{}{12}$

3. Change:

$\frac{1}{3}$ to ninths	$\frac{1}{3}$ to fifteenths	$\frac{2}{3}$ to fifteenths	$\frac{1}{5}$ to tenths
$\frac{2}{5}$ to tenths	$\frac{2}{5}$ to fifteenths	$\frac{3}{5}$ to 20ths	$\frac{3}{5}$ to 25ths
$\frac{4}{5}$ to 30ths	$\frac{3}{4}$ to 24ths	$\frac{2}{3}$ to 24ths	$\frac{5}{8}$ to 24ths
$\frac{5}{6}$ to 24ths	$\frac{5}{12}$ to 24ths	$\frac{1}{2}$ to 24ths	$\frac{3}{7}$ to 21sts

4. Change:

$\frac{3}{4}$ and $\frac{2}{3}$ to twelfths	$\frac{1}{2}$ and $\frac{5}{6}$ to twelfths	$\frac{3}{9}$ and $\frac{1}{3}$ to 18ths
$\frac{1}{2}$ and $\frac{5}{6}$ to 18ths	$\frac{3}{4}$ and $\frac{3}{5}$ to 20ths	$\frac{1}{2}$ and $\frac{1}{3}$ to 12ths

5. Changing two or more fractions to other fractions, all of which have the same denominator, is called changing to *common denominator*, and we usually wish to change to the *least* common denominator. To do this well, we need to study *least common multiple.*

Now, the least common multiple of two or more numbers is the smallest number that will exactly contain each of them.

6. What is the least common multiple of 2 and 4? 2 and 3? 2 and 5? 5 and 10? 3 and 4? 3 and 5? 3 and 6? 3 and 18? 7 and 14? 15 and 5? 8 and 3? 24 and 8?

7. Change these fractions to fractions having the least common denominator:

$\frac{1}{2}$ and $\frac{2}{4}$ $\frac{1}{2}$ and $\frac{2}{3}$ $\frac{4}{5}$ and $\frac{1}{2}$ $\frac{4}{5}$ and $\frac{3}{10}$ $\frac{2}{3}$ and $\frac{3}{4}$ $\frac{2}{4}$ and $\frac{2}{5}$
$\frac{2}{3}$ and $\frac{5}{6}$ $\frac{1}{3}$ and $\frac{5}{18}$ $\frac{5}{7}$ and $\frac{3}{14}$ $\frac{10}{15}$ and $\frac{3}{5}$ $\frac{5}{8}$ and $\frac{2}{3}$ $\frac{1}{6}$ and $\frac{1}{9}$

8. Give the l. c. m. of:

2, 4, 6	4, 6, 8	6, 9, 12	6, 12, 14	6, 12, 15
15, 21	18, 21	6, 12, 24	18, 54	4, 6, 8, 12

9. Reduce to fractions having the least common denominator:

$\frac{1}{6}$ and $\frac{1}{9}$ $\frac{1}{12}$ and $\frac{1}{6}$ $\frac{3}{12}$ and $\frac{1}{9}$ $\frac{1}{12}$ and $\frac{1}{24}$ and $\frac{1}{8}$
$\frac{7}{12}$ and $\frac{5}{8}$ $\frac{1}{15}$ and $\frac{6}{5}$ $\frac{4}{6}$ and $\frac{3}{54}$ $\frac{9}{18}$ and $\frac{1}{2}$ and $\frac{2}{3}$
$\frac{2}{5}$ and $\frac{11}{12}$ $\frac{2}{3}$ and $\frac{4}{7}$ $\frac{2}{3}$ and $\frac{1}{7}$ $\frac{3}{8}$ and $\frac{5}{6}$ and $\frac{3}{4}$
$\frac{7}{12}$ and $\frac{3}{6}$ $\frac{3}{24}$ and $\frac{5}{6}$ $\frac{3}{12}$ and $\frac{3}{6}$ $\frac{7}{15}$ and $\frac{4}{5}$ and $\frac{5}{9}$
$\frac{3}{8}$ and $\frac{2}{3}$ $\frac{13}{30}$ and $\frac{1}{3}$ $\frac{1}{7}$ and $\frac{5}{9}$ $\frac{4}{5}$ and $\frac{5}{12}$ and $\frac{3}{4}$

150

1. 3 sixths plus two sixths are how many sixths?

2. 2 fourths plus 1 fourth are how many 4ths?

3. 4 twelfths and 3 twelfths are how many twelfths?

4. 5 tenths and 2 tenths are how many 10ths?

5. 5 fifteenths plus three 15ths are how many 15ths?

6. $\frac{5}{20}+\frac{4}{20}=?$ $\frac{1}{6}+\frac{3}{6}=?$ $\frac{2}{6}+\frac{3}{6}=?$ $\frac{3}{12}+\frac{2}{12}=?$ $\frac{5}{30}+\frac{6}{30}=?$
$\frac{2}{14}+\frac{7}{14}=?$ $\frac{3}{21}+\frac{7}{21}=?$ $\frac{7}{28}+\frac{4}{28}=?$ $\frac{7}{35}+\frac{5}{35}=?$ $\frac{5}{60}+\frac{17}{30}=?$

Change to least common denominator and add:

7. $\frac{1}{2}, \frac{1}{3}$ $\frac{1}{2}, \frac{1}{4}$ $\frac{1}{3}, \frac{1}{4}$ $\frac{1}{2}, \frac{1}{5}$ $\frac{1}{3}, \frac{1}{5}$ $\frac{1}{4}, \frac{1}{5}$ $\frac{1}{6}, \frac{1}{2}$ $\frac{1}{3}, \frac{1}{6}$

8. $\frac{1}{4}, \frac{1}{6}$ $\frac{1}{6}, \frac{1}{5}$ $\frac{1}{7}, \frac{1}{2}$ $\frac{1}{7}, \frac{1}{3}$ $\frac{1}{4}, \frac{1}{7}$ $\frac{1}{5}, \frac{1}{7}$ $\frac{1}{6}, \frac{1}{7}$ $\frac{1}{2}, \frac{1}{8}$

9. $\frac{1}{3}, \frac{1}{8}$ $\frac{1}{8}, \frac{1}{4}$ $\frac{1}{8}, \frac{1}{5}$ $\frac{1}{6}, \frac{1}{8}$ $\frac{1}{7}, \frac{1}{8}$ $\frac{1}{10}, \frac{1}{3}$ $\frac{1}{10}, \frac{1}{9}$ $\frac{1}{5}, \frac{1}{10}$

10. $\frac{1}{2}+\frac{2}{3}$ $\frac{1}{2}+\frac{3}{4}$ $\frac{1}{4}+\frac{2}{3}$ $\frac{1}{3}+\frac{3}{4}$ $\frac{1}{5}+\frac{2}{3}$ $\frac{1}{5}+\frac{3}{4}$ $\frac{2}{5}+\frac{2}{3}$ $\frac{5}{7}+\frac{1}{3}$

11. $\frac{2}{5}+\frac{4}{4}$ $\frac{3}{5}+\frac{1}{4}$ $\frac{3}{5}+\frac{1}{3}$ $\frac{3}{5}+\frac{2}{3}$ $\frac{3}{5}+\frac{3}{4}$ $\frac{3}{5}+\frac{9}{10}$ $\frac{5}{12}+\frac{5}{6}$ $\frac{5}{7}+\frac{1}{4}$

12. $\frac{11}{20}+\frac{1}{5}+\frac{3}{4}$ $\frac{4}{15}+\frac{2}{4}+\frac{2}{5}$ $\frac{2}{7}+\frac{3}{8}+\frac{1}{2}$ $\frac{3}{5}+\frac{7}{10}+\frac{9}{20}$ $\frac{11}{12}+\frac{3}{8}+\frac{2}{3}$

13. $\frac{2}{3}+\frac{5}{6}$ $\frac{1}{20}+\frac{4}{5}$ $\frac{3}{8}+\frac{4}{5}$ $\frac{3}{7}+2\frac{3}{21}$ $\frac{2}{3}+\frac{4}{7}$ $\frac{5}{9}+\frac{1}{2}$ $\frac{4}{5}+\frac{2}{3}+\frac{1}{2}$

14. $\frac{5}{9}+\frac{2}{3}$ $\frac{5}{12}+\frac{1}{3}$ $\frac{2}{7}+\frac{2}{3}$ $\frac{2}{7}+\frac{1}{2}$ $\frac{5}{9}+\frac{6}{7}$ $\frac{4}{11}+\frac{1}{2}$ $\frac{4}{5}+\frac{2}{7}+\frac{1}{2}$

15. $\frac{5}{6}+\frac{3}{8}$ $\frac{3}{8}+\frac{3}{7}$ $\frac{4}{5}+\frac{2}{9}$ $\frac{4}{5}+\frac{3}{4}$ $\frac{4}{7}+\frac{4}{5}$ $\frac{5}{8}+\frac{2}{5}$ $\frac{5}{7}+\frac{2}{3}+\frac{1}{2}$

16. $\frac{5}{8}+\frac{1}{2}$ $\frac{2}{5}+\frac{2}{3}$ $\frac{3}{5}+\frac{2}{3}$ $\frac{3}{5}+\frac{1}{3}$ $\frac{3}{4}+\frac{1}{9}$ $\frac{9}{10}+\frac{1}{3}$ $\frac{3}{12}+\frac{3}{15}+\frac{1}{3}$

17. $\frac{7}{12}+\frac{7}{8}$ $\frac{3}{8}+\frac{1}{12}$ $\frac{3}{4}+\frac{2}{5}$ $\frac{1}{5}+\frac{1}{11}$ $\frac{5}{13}+\frac{1}{3}$ $\frac{3}{9}+\frac{3}{7}$ $\frac{7}{10}+\frac{7}{8}+\frac{1}{4}$

18. $\frac{1}{2}+\frac{1}{4}+\frac{1}{5}$ $\frac{2}{3}+\frac{1}{2}+\frac{1}{6}$ $\frac{3}{7}+\frac{1}{2}+\frac{2}{7}$ $\frac{3}{5}+\frac{2}{3}+\frac{1}{5}$ $\frac{1}{3}+\frac{1}{2}+\frac{1}{4}$

19. $\frac{3}{4}+\frac{1}{3}+\frac{5}{6}$ $\frac{5}{8}+\frac{1}{4}+\frac{1}{2}$ $\frac{1}{3}+\frac{1}{8}+\frac{1}{12}$ $\frac{1}{2}+\frac{1}{12}+\frac{1}{4}$ $\frac{2}{3}+\frac{3}{4}+\frac{1}{2}$

20. $\frac{7}{9}+\frac{2}{3}+\frac{1}{2}$ $\frac{1}{8}+\frac{2}{3}+\frac{1}{4}$ $\frac{3}{10}+\frac{4}{5}+\frac{1}{2}$ $\frac{2}{3}+\frac{2}{5}+\frac{2}{9}$ $\frac{3}{5}+\frac{3}{7}+\frac{1}{2}$

21. $\frac{1}{2}+\frac{1}{3}+\frac{1}{8}+\frac{1}{12}$ $\frac{2}{3}+\frac{1}{8}+\frac{1}{2}+\frac{1}{12}$ $\frac{5}{6}+\frac{1}{3}+\frac{1}{2}+\frac{3}{4}$ $\frac{1}{3}+\frac{1}{6}+\frac{1}{9}+\frac{1}{2}$

22. $\frac{2}{5}+\frac{1}{4}+\frac{1}{2}+\frac{7}{20}$ $\frac{4}{9}+\frac{1}{3}+\frac{1}{4}+\frac{1}{12}$ $\frac{1}{15}+\frac{1}{20}+\frac{1}{12}+\frac{4}{5}$

23. $\frac{3}{50}+\frac{4}{25}$ $\frac{4}{72}+\frac{5}{8}$ $\frac{50}{81}+\frac{4}{9}$ $\frac{27}{30}+\frac{17}{90}$ $\frac{14}{32}+\frac{7}{16}$ $\frac{11}{132}+\frac{3}{11}$

24. $\frac{14}{121}+\frac{2}{11}$ $\frac{17}{51}+\frac{3}{17}$ $\frac{4}{11}+\frac{4}{9}$ $\frac{5}{121}+\frac{2}{3}$ $\frac{8}{21}+\frac{3}{49}$ $\frac{2}{8}+\frac{9}{100}$

151

1. A boy spent $\frac{1}{2}$ of a dollar for a top, $\frac{1}{3}$ of a dollar for paper, and $\$\frac{1}{4}$ for a ball. What did he spend for all?

2. A farmer sold one-half of his crop to one man and $\frac{3}{7}$ to another. What part of his crop did he sell to the two men?

3. Joel studied his spelling $\frac{1}{3}$ of an hour and his music $\frac{3}{4}$ of an hour. How long did he spend studying both?

4. A father willed $\frac{2}{5}$ of his property to his son and $\frac{2}{7}$ to his daughter. What part of his property did he will to both?

5. From my house to my grandmother's is $\frac{7}{8}$ of a mile; from there to my uncle's is $\frac{3}{4}$ of a mile. How far from my house to my uncle's?

6. A traveler went $\frac{1}{5}$ of his journey on Monday, $\frac{1}{10}$ on Tuesday, $\frac{1}{12}$ on Wednesday, and $\frac{1}{4}$ on Thursday. What part of his journey did he go in the four days?

7. A tailor used $\frac{2}{9}$ of a piece of cloth in making one suit, and $\frac{5}{12}$ of the piece in another suit. What part of the piece did he use in the two?

8. A milkman leaves $\frac{2}{3}$ of a gallon of milk at one house, $\frac{3}{4}$ of a gallon at another, and $\frac{3}{8}$ of a gallon at another. How much does he leave at the three houses?

9. Anna put $\frac{1}{4}$ of a dollar in the bank, she paid $\frac{2}{5}$ of a dollar for ribbon, and $\frac{1}{10}$ of a dollar for car fare. What part of a dollar did she spend altogether?

10. A gardener planted $\frac{3}{8}$ of his garden in sweet peas, $\frac{2}{7}$ in carnations, and $\frac{1}{14}$ in violets. What part of his garden is planted in peas, carnations, and violets?

11. John used $\frac{1}{8}$ of a pound of nails in building a boat, and $\frac{5}{24}$ of a pound in building a coaster. What part of a pound did he use?

12. A tailor uses $\frac{7}{8}$ of a yard of cloth in making the jacket, and $\frac{11}{12}$ of a yard in making the trousers, of a boy's suit. How many yards in the suit?

13. Amy practices her music lesson for $\frac{9}{10}$ of an hour and sews for $\frac{5}{12}$ of an hour. How long does she sew and practice?

14. Harry and James started from a certain point and walked in opposite directions. When Harry had walked $\frac{5}{9}$ of a mile and James $\frac{11}{12}$ of a mile, how far apart were they?

15. Laura has done $\frac{3}{4}$ of a yard of hemming and her sister $\frac{2}{3}$ of a yard. How much have the two girls done?

16. What is the sum of $\frac{3}{7}$ yd. and $\frac{3}{8}$ yd.?

17. $\frac{5}{11}$ rod and $\frac{5}{12}$ rod are how many rods?

18. $\frac{9}{10}$ acre and $\frac{10}{11}$ acre are how many acres?

19. Add $\frac{2}{3}$ lb., $\frac{5}{6}$ lb., $\frac{1}{2}$ lb., and $\frac{3}{4}$ lb.

20. Add $\frac{7}{24}$ da. and $\frac{2}{3}$ da.

152

1.
$\frac{3}{4}-\frac{2}{4}$
$\frac{3}{4}-\frac{1}{4}$
$\frac{3}{5}-\frac{2}{5}$
$\frac{4}{5}-\frac{3}{5}$
$\frac{5}{5}-\frac{3}{5}$
$\frac{3}{6}-\frac{2}{6}$
$\frac{5}{6}-\frac{4}{6}$
$\frac{6}{6}-\frac{6}{6}$
$\frac{5}{9}-\frac{4}{9}$
$\frac{9}{12}-\frac{7}{12}$

2.
$\frac{9}{20}-\frac{1}{5}$
$\frac{19}{20}-\frac{3}{4}$
$\frac{17}{20}-\frac{2}{5}$
$\frac{3}{2}-\frac{7}{8}$
$\frac{6}{5}-\frac{3}{10}$
$\frac{4}{3}-\frac{3}{4}$
$\frac{20}{15}-\frac{2}{3}$
$\frac{12}{11}-\frac{11}{12}$
$\frac{9}{5}-\frac{7}{8}$
$\frac{100}{9}-\frac{3}{4}$

3.
$\frac{1}{2}+\frac{1}{4}-\frac{1}{3}$
$\frac{1}{3}+\frac{1}{2}-\frac{1}{4}$
$\frac{1}{3}+\frac{1}{4}-\frac{1}{2}$
$\frac{2}{3}+\frac{1}{4}-\frac{1}{2}$
$\frac{1}{3}+\frac{3}{4}-\frac{1}{2}$
$\frac{1}{3}+\frac{1}{4}-\frac{1}{12}$
$\frac{3}{11}-\frac{2}{3}-\frac{1}{33}$
$\frac{9}{10}-\frac{1}{2}-\frac{1}{5}$
$\frac{11}{12}-\frac{1}{3}-\frac{1}{4}$
$\frac{17}{20}-\frac{3}{5}-\frac{1}{4}$

4.
$\frac{7}{8}-\frac{3}{4}$
$\frac{2}{3}-\frac{7}{10}$
$\frac{5}{8}-\frac{5}{9}$
$\frac{1}{2}-\frac{1}{3}$
$\frac{1}{3}-\frac{1}{4}$
$\frac{3}{4}-\frac{2}{3}$
$\frac{1}{9}-\frac{1}{10}$
$\frac{2}{3}-\frac{1}{2}$
$\frac{9}{10}-\frac{1}{2}$
$\frac{5}{7}-\frac{2}{3}$

5.
$\frac{3}{4}-\frac{1}{2}$
$\frac{3}{4}-\frac{2}{3}$
$\frac{2}{3}-\frac{1}{6}$
$\frac{5}{8}-\frac{1}{2}$
$\frac{7}{12}-\frac{1}{6}$
$\frac{5}{8}-\frac{1}{3}$
$\frac{11}{12}-\frac{5}{6}$

6.
$\frac{50}{8}-\frac{3}{4}$
$\frac{25}{6}-\frac{2}{3}$
$\frac{15}{2}-\frac{3}{8}$
$\frac{21}{10}-\frac{4}{5}$
$\frac{33}{2}-\frac{1}{4}$
$\frac{121}{4}-\frac{1}{2}$
$\frac{63}{2}-\frac{1}{3}$

7.
$\frac{19}{24}-\frac{3}{8}-\frac{1}{3}$
$\frac{24}{25}-\frac{2}{5}-\frac{1}{5}$
$\frac{75}{100}-\frac{3}{20}-\frac{3}{10}$
$\frac{83}{84}-\frac{1}{12}-\frac{1}{7}$
$\frac{25}{36}-\frac{1}{4}-\frac{4}{9}$
$\frac{16}{39}-\frac{1}{3}-\frac{1}{13}$
$\frac{13}{24}-\frac{1}{3}-\frac{1}{8}$

153

1. Gerald had $\frac{3}{4}$ of a dollar and spent $\frac{1}{2}$ dollar. How much did he save?

2. A man owned $\frac{11}{12}$ of an acre of land and sold $\frac{5}{6}$ of an acre. What part of an acre remained unsold?

3. Amy had $\frac{2}{3}$ of a yard of hemming to do. When she had hemmed $\frac{1}{12}$ of a yard, what part of a yard had she still to hem?

4. A gardener owns $\frac{7}{8}$ of an acre of land; $\frac{3}{4}$ of an acre is planted in roses and the rest of his land in violets. What part of an acre is in violets?

5. A man owned a $\frac{3}{4}$ interest in a mine. He sold $\frac{1}{9}$ of the mine. What part of the mine did he still own?

6. Roy lives $1\frac{5}{6}$ of a mile from school. If he rides $\frac{7}{8}$ of a mile what part of a mile has he to walk?

7. John had $\frac{7}{8}$ of a pound of nails. He used $\frac{3}{4}$ of a pound in building a pigeon house. What part of a pound had he left?

8. James earned $\frac{7}{10}$ of a dollar and Reginald $\frac{17}{20}$ of a dollar. Which earned more, and how much more?

9. Rollo did $\frac{1}{7}$ of a piece of work and Roy did $\frac{1}{8}$. Which did more, and how much?

10. Joe ran $\frac{11}{12}$ of a mile. Henry ran $\frac{5}{6}$ of a mile. Which ran farther and how much?

154

Find sum of and difference between:

1. $1\frac{1}{2}$, $\frac{1}{4}$	2. $1\frac{1}{2}$, $1\frac{1}{4}$	3. $1\frac{1}{2}$, $\frac{3}{4}$
4. $1\frac{1}{2}$, $\frac{1}{3}$	5. $1\frac{1}{2}$, $1\frac{1}{3}$	6. $1\frac{1}{2}$, $\frac{2}{3}$
7. $1\frac{1}{2}$, $\frac{1}{5}$	8. $1\frac{1}{2}$, $1\frac{1}{5}$	9. $1\frac{1}{2}$, $\frac{3}{5}$

10. $1\frac{1}{3}, \frac{1}{2}$
11. $1\frac{2}{3}, 1\frac{1}{2}$
12. $1\frac{2}{3}, \frac{1}{2}$
13. $1\frac{1}{3}, \frac{1}{4}$
14. $1\frac{1}{3}, 1\frac{1}{4}$
15. $1\frac{2}{3}, \frac{3}{4}$
16. $1\frac{1}{4}, \frac{1}{5}$
17. $1\frac{1}{4}, 1\frac{1}{5}$
18. $1\frac{3}{4}, \frac{4}{5}$
19. $1\frac{1}{4}, \frac{1}{6}$
20. $1\frac{1}{4}, 1\frac{1}{6}$
21. $1\frac{1}{4}, \frac{5}{6}$
22. $1\frac{1}{5}, \frac{1}{10}$
23. $1\frac{1}{5}, 1\frac{1}{10}$
24. $1\frac{3}{4}, \frac{9}{10}$
25. $1\frac{1}{6}, \frac{1}{2}$
26. $1\frac{4}{6}, 1\frac{1}{2}$
27. $1\frac{5}{6}, 1\frac{1}{2}$
28. $1\frac{1}{8}, \frac{1}{4}$
29. $1\frac{3}{8}, 1\frac{1}{4}$
30. $1\frac{7}{8}, 1\frac{3}{4}$
31. $1\frac{1}{8}, \frac{1}{2}$
32. $1\frac{4}{8}, 1\frac{1}{2}$
33. $1\frac{7}{8}, 1\frac{3}{2}$
34. $1\frac{1}{8}, \frac{1}{3}$
35. $1\frac{5}{8}, 1\frac{1}{3}$
36. $1\frac{2}{3}, 1\frac{5}{8}$
37. $1\frac{1}{10}, \frac{1}{5}$
38. $1\frac{1}{10}, 1\frac{1}{5}$
39. $1\frac{9}{10}, 1\frac{4}{5}$
40. $1\frac{1}{2}, \frac{1}{10}$
41. $1\frac{1}{2}, 1\frac{1}{10}$
42. $1\frac{1}{2}, 1\frac{3}{10}$

155

1. Margaret has $1\frac{1}{2}$ yards of ribbon on her hat and $\frac{1}{4}$ of a yard for her hair. How many yards has she in the two pieces?

2. Willie lives $1\frac{2}{3}$ miles from school. Robert lives $1\frac{1}{2}$ miles from school in the opposite direction. How far apart do they live?

3. John and his brother bought a present for their mother. John contributed $1\frac{3}{4}$ dollars and his brother $\$ 2\frac{1}{2}$. What did the present cost?

4. Henry chopped $1\frac{7}{8}$ cords of wood in one week and $2\frac{1}{4}$ cords the next. How much did he chop in the two weeks?

5. Amy gathered $1\frac{2}{3}$ pecks of berries, while Jane gathered $1\frac{5}{8}$ pecks. How much did the two girls gather?

6. A man owns two cows; one gives $2\frac{1}{2}$ gallons of milk a day and the other gives $1\frac{7}{8}$ gallons. How much do both give?

7. Robert paid $\$1\frac{3}{5}$ for books and $\$1\frac{4}{5}$ for repairs to his bicycle. What did he pay for all?

8. Myrtle paid $\$1$ for a car ticket, $\$1\frac{3}{10}$ for thread, needles, and thimble, and $\$\frac{7}{8}$ for ribbon. How much did she spend?

9. In going a journey Harry traveled $12\frac{4}{9}$ miles by boat and $10\frac{2}{3}$ miles by cars. How long was the journey?

10. Two men started from the same point and traveled in opposite directions, one at the rate of $9\frac{2}{9}$ miles per hour, and the other at the rate of $8\frac{3}{6}$ miles per hour. How far apart were they at the end of an hour?

156

1. $2-\frac{3}{4}$	**2.** $2-1\frac{1}{2}$	**3.** $2\frac{7}{8}-1\frac{5}{8}$
4. $3-\frac{1}{2}$	**5.** $5-1\frac{3}{4}$	**6.** $3\frac{3}{6}-1\frac{2}{6}$
7. $3-\frac{3}{4}$	**8.** $7-1\frac{1}{3}$	**9.** $4\frac{9}{10}-2\frac{5}{10}$
10. $4-\frac{7}{8}$	**11.** $12-1\frac{5}{8}$	**12.** $10\frac{7}{24}-9\frac{5}{24}$
13. $2-\frac{5}{6}$	**14.** $12-2\frac{5}{8}$	**15.** $12\frac{14}{15}-10\frac{2}{5}$
16. $8-\frac{7}{8}$	**17.** $21-5\frac{2}{3}$	**18.** $15\frac{2}{3}-10\frac{1}{6}$
19. $1-\frac{7}{12}$	**20.** $20-2\frac{3}{7}$	**21.** $2\frac{11}{15}-1\frac{1}{3}$
22. $12-\frac{3}{4}$	**23.** $25-10\frac{1}{2}$	**24.** $17\frac{1}{2}-15\frac{1}{4}$
25. $10-\frac{5}{8}$	**26.** $30-9\frac{1}{3}$	**27.** $50\frac{2}{3}-25\frac{1}{2}$
28. $20-\frac{7}{12}$	**29.** $36-8\frac{3}{4}$	**30.** $27\frac{1}{2}-20$
31. $24-\frac{7}{11}$	**32.** $40-20\frac{1}{2}$	**33.** $35\frac{11}{12}-30$
34. $25-\frac{4}{5}$	**35.** $44-25\frac{1}{8}$	**36.** $28\frac{3}{4}-4\frac{1}{8}$
37. $25-\frac{3}{11}$	**38.** $45-16\frac{2}{3}$	**39.** $49\frac{3}{4}-\frac{1}{16}$
40. $39-\frac{7}{10}$	**41.** $50-1\frac{1}{3}$	**42.** $63\frac{2}{3}-\frac{1}{2}$

157

1. From a piece of beef weighing 40 pounds, $10\frac{1}{2}$ pounds were cut. How much did the remainder weigh?

2. A grocer had 100 pounds of dates. He sold $35\frac{3}{4}$ pounds. How many pounds had he left?

3. I had a journey of $36\frac{9}{10}$ miles to go. After I had traveled 25 miles how much had I still to travel?

4. Roy traveled $24\frac{1}{2}$ miles by cars and $20\frac{1}{3}$ miles by boat. How much farther did he travel by cars than by boat?

5. A farmer has $15\frac{8}{10}$ acres of corn and $12\frac{3}{7}$ acres of wheat. How many more acres of corn than wheat has he?

6. In one tent there are $48\frac{3}{5}$ yards; in another there are $40\frac{3}{10}$ yards. How much more in the first than in the second?

7. Laura has $\$25\frac{9}{10}$ in the bank. How much more must she put in so as to have \$50?

8. June spent $\$27\frac{1}{4}$ and Laura spent $\$21\frac{1}{5}$. How much more did June spend than Laura?

9. It is $20\frac{2}{3}$ miles from my home to my cousin's and $15\frac{2}{5}$ miles to my uncle's. How much farther to my cousin's than to my uncle's?

10. A girl used $5\frac{7}{8}$ yards from a piece of lace containing 25 yards. How many yards had she still in the piece?

158

1. $4\frac{1}{4} - \frac{1}{2}$	2. $4\frac{1}{4} - 1\frac{1}{2}$	3. $7\frac{3}{5} - 4\frac{2}{3}$
4. $2\frac{1}{3} - \frac{1}{2}$	5. $2\frac{1}{3} - 1\frac{1}{2}$	6. $25\frac{1}{2} - 17\frac{3}{4}$
7. $3\frac{1}{2} - \frac{2}{3}$	8. $3\frac{1}{3} - 1\frac{2}{3}$	9. $30\frac{2}{3} - 20\frac{3}{4}$
10. $3\frac{1}{2} - \frac{4}{5}$	11. $3\frac{1}{2} - 1\frac{3}{4}$	12. $12\frac{9}{10} - 10\frac{11}{12}$

13. $3\frac{1}{2} - \frac{3}{4}$
14. $3\frac{1}{2} - 1\frac{4}{5}$
15. $24\frac{1}{10} - 15\frac{4}{5}$
16. $2\frac{1}{8} - \frac{5}{6}$
17. $2\frac{1}{8} - 1\frac{5}{6}$
18. $30\frac{2}{3} - 25\frac{11}{12}$
19. $10\frac{2}{3} - \frac{3}{4}$
20. $10\frac{2}{3} - 1\frac{3}{4}$
21. $45\frac{1}{8} - 16\frac{1}{2}$
22. $20\frac{1}{8} - \frac{7}{10}$
23. $20\frac{1}{8} - 1\frac{7}{10}$
24. $30\frac{1}{4} - 28\frac{1}{2}$
25. $15\frac{3}{20} - \frac{9}{10}$
26. $15\frac{3}{20} - 1\frac{9}{10}$
27. $50\frac{1}{20} - 12\frac{9}{20}$
28. $8\frac{1}{3} - \frac{2}{3}$
29. $8\frac{1}{3} - 1\frac{2}{3}$
30. $48\frac{2}{11} - 40\frac{1}{2}$
31. $15\frac{1}{4} - \frac{3}{4}$
32. $15\frac{1}{4} - 1\frac{3}{4}$
33. $25\frac{3}{5} - 20\frac{4}{5}$
34. $17\frac{2}{3} - \frac{1}{3}$
35. $12\frac{1}{4} - \frac{2}{4}$
36. $16\frac{3}{8} - 10\frac{5}{8}$

159

1. From a barrel containing $31\frac{1}{2}$ gallons of vinegar, $20\frac{2}{3}$ gallons were drawn. How many gallons remained?

2. $3\frac{3}{4}$ yards of string were lost from a kite string containing $30\frac{1}{3}$ yards. How long was the string then?

3. $7\frac{1}{2}$ gallons leaked out of a cask containing $20\frac{1}{4}$ gallons. How many gallons were left?

4. Arnold saved $\$12\frac{7}{8}$ last month and $\$15\frac{1}{2}$ this month. How much more did he save this month than last month?

5. Bertha made $3\frac{2}{3}$ yards of lace. Her sister made $4\frac{1}{2}$ yards. How much less did Bertha make than her sister?

6. It required $5\frac{2}{3}$ yards to make a skirt and $1\frac{7}{8}$ yards to make a waist. How many more yards in the skirt than in the waist?

7. Two boys started from the same point; one traveled $12\frac{2}{3}$ miles per hour and the other $10\frac{3}{4}$ miles per hour in the same direction. How far apart were they at the end of an hour?

8. Frank gave his sister $\$1\frac{3}{4}$. He gave his brother $\$2\frac{1}{10}$. How much more did he give his brother than his sister?

9. I paid $\$65\frac{5}{8}$ for a horse and sold him for $\$87\frac{7}{8}$. How much did I gain?

10. If a ton of hay cost $\$10\frac{1}{4}$ and was sold for $\$11\frac{3}{8}$, how much was gained?

11. A man raised 150 bushels of potatoes. He sold all but $30\frac{1}{4}$ bu. How much did he sell?

12. A farmer owned $72\frac{3}{16}$ acres of land and bought $10\frac{1}{8}$ acres more. How much had he then?

13. After $29\frac{1}{3}$ rods of fence had been built, $15\frac{1}{2}$ yards remained to be built. How long was the fence to be?

14. I had $\$40$ in the bank. I put in $\$25\frac{3}{4}$ more and afterward drew out $\$20\frac{3}{8}$. How much then remained?

15. There are 30 acres in my farm. $3\frac{1}{4}$ acres are in orchard, $5\frac{2}{9}$ acres are in grain, and the remainder is pasture land. How many acres of pasture have I?

16. From a bin containing $30\frac{2}{3}$ bu. of oats, $2\frac{1}{2}$ bu. were sold at one time and 10 bu. at another time. How many bushels were left in the bin?

17. Jesse earned $\$5\frac{1}{2}$ last week and $\$3\frac{5}{8}$ this week. He put all but $\$5$ in the bank. How much did he put in the bank?

18. After selling $5\frac{5}{6}$ dozen eggs, a boy had $7\frac{2}{3}$ dozen left. How many had he at first?

19. Mason read $55\frac{1}{2}$ pages yesterday, and 10 pages to-day. There are 100 pages in the book. How many pages has he yet to read?

20. One room required $32\frac{1}{3}$ yards of carpet; another, $29\frac{3}{4}$ yards. How many yards in both rooms?

160

$\frac{1}{4} + \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$ $\qquad$ $\frac{1}{3} + \frac{1}{3} = \frac{2}{3}$

$2 \times \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$ $\qquad$ $2 \times \frac{1}{3} = \frac{2}{3}$

$\frac{1}{4} \times 2 = \frac{2}{4} = \frac{1}{2}$ $\qquad$ $\frac{1}{3} \times 2 = \frac{2}{3}$

1. A boy paid $\$\frac{1}{4}$ for each one of 2 balls. What did he pay for both?

2. He bought 2 books at a quarter apiece. What did they cost?

3. Milton had \$2. He gave away one-fourth of it. How much did he give away?

4. How much will 2 bottles, containing $\frac{1}{3}$ ounce each, hold?

5. A man had 2 acres of land and sold $\frac{1}{3}$ of it. How many acres did he sell?

6. $2 \times \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$

$\not{2} \times \frac{1}{\not{4}_{2}} = \frac{1}{2}$

$\frac{1}{\not{4}_{2}}$ of $\not{2} = \frac{1}{2}$

7. $6 \times \frac{1}{3} = \frac{6}{3} = 2$

$\overset{2}{\not{6}} \times \frac{1}{\not{3}} = 2$

$\frac{1}{\not{3}}$ of $\overset{2}{\not{6}} = 2$

8. $3 \times \frac{2}{9} =$

$\frac{2}{9} \times 3 =$

9. $5 \times \frac{2}{10} =$

$\frac{2}{10} \times 5 =$

10. $\frac{3}{4}$ of $12 = ?$ $\qquad$ $12 \times \frac{3}{4} = ?$

11. $8 \times \frac{3}{4} = ?$ $\qquad$ $\frac{3}{4} \times 8 = ?$

12. $9 \times \frac{2}{3} = ?$ $\qquad$ $\frac{2}{3} \times 9 = ?$

13. $16 \times \frac{3}{4} = ?$ $\qquad$ $\frac{3}{4} \times 16 = ?$

161

1. There are 3 feet in a yard. How many feet in $\frac{2}{9}$ yard?

2. How many feet in $\frac{5}{6}$ yd.? In $\frac{5}{12}$ yd.?

3. There are 4 qt. in a gallon. How many quarts in $\frac{5}{8}$ gal.? In $\frac{7}{12}$ gal.?

4. What will 6 tops cost at $\$\frac{1}{3}$ each?

5. 8 pieces of ribbon $\frac{3}{4}$ of a yard long contain how many yards?

6. I bought 5 pounds of candy at $\frac{3}{10}$ of a dollar per pound. What did it cost?

7. When calico is 10 cents a yard, what does $\frac{2}{5}$ of a yard cost?

8. There are 8 pints in a gallon. How many pints in $\frac{5}{16}$ gallons?

9. At 75 cents a pound, what will $\frac{4}{15}$ of a pound of tea cost?

10. At $2 a ton, what will $\frac{5}{6}$ ton hay cost?

162

1.	$\frac{2}{3}$ of 36	$\frac{3}{11}$ of 66	$\frac{11}{12}$ of 132	$\frac{7}{8}$ of 64	$\frac{4}{9}$ of 54
2.	$\frac{10}{11}$ of 110	$\frac{5}{7}$ of 56	$\frac{3}{8}$ of 48	$\frac{5}{12}$ of 120	$\frac{5}{9}$ of 63
3.	$\frac{3}{7}$ of 42	$\frac{7}{12}$ of 144	$\frac{8}{9}$ of 63	$\frac{3}{8}$ of 40	$\frac{2}{3}$ of 120
4.	$15\times\frac{4}{5}$	$72\times\frac{5}{9}$	$36\times\frac{5}{6}$	$8\times\frac{1}{32}$	
5.	$63\times\frac{7}{9}$	$72\times\frac{5}{8}$	$36\times\frac{3}{4}$	$9\times\frac{1}{27}$	
6.	$84\times\frac{5}{7}$	$72\times\frac{5}{6}$	$36\times\frac{11}{12}$	$8\times\frac{1}{56}$	
7.	$96\times\frac{5}{8}$	$72\times\frac{5}{12}$	$36\times\frac{2}{3}$	$10\times\frac{1}{40}$	
8.	$55\times\frac{2}{5}$	$72\times\frac{5}{18}$	$36\times\frac{7}{9}$	$12\times\frac{1}{60}$	

9. $\frac{1}{16}$ of 8 $\quad$ $\frac{1}{15}$ of 5 $\quad$ $\frac{1}{18}$ of 3 $\quad$ $\frac{1}{18}$ of 6 $\quad$ $\frac{1}{14}$ of 7

10. $\frac{1}{11}$ of 22 $\quad$ $\frac{1}{22}$ of 11 $\quad$ $\frac{1}{24}$ of 6 $\quad$ $\frac{1}{6}$ of 24 $\quad$ $\frac{1}{20}$ of 5

11. $\frac{1}{21}$ of 7 $\quad$ $\frac{1}{60}$ of 12 $\quad$ $\frac{1}{24}$ of 12 $\quad$ $\frac{1}{48}$ of 16 $\quad$ $\frac{1}{100}$ of 25

12. $\frac{1}{50}$ of 2 $\quad$ $\frac{1}{25}$ of 5 $\quad$ $\frac{1}{20}$ of 4 $\quad$ $\frac{1}{60}$ of 6 $\quad$ $\frac{1}{44}$ of 11

163

1. $\frac{1}{2}$ of 2 dollars = 1 dollar.

$\frac{1}{2}$ of 2 thirds = 1 third.

$$\frac{1}{2} \text{ of } \frac{2}{3} = \frac{1}{3} \qquad \frac{1}{2} \times \frac{2}{3} = \frac{1}{3} \qquad \frac{1}{\cancel{2}} \times \frac{\overset{1}{\cancel{2}}}{3} = \frac{1}{3}$$

2. $\frac{1}{3}$ of 6 apples = 2 apples.

$\frac{1}{3}$ of 6 sevenths = 2 sevenths.

$$\frac{1}{3} \text{ of } \frac{6}{7} = \frac{6}{21} = \frac{2}{7} \qquad \frac{1}{\cancel{3}} \times \frac{\overset{2}{\cancel{6}}}{7} = \frac{2}{7}$$

3. $\frac{1}{3} \times \frac{3}{7} = \frac{3}{21} = \frac{1}{7}$, or $\frac{1}{\cancel{3}} \times \frac{\overset{1}{\cancel{3}}}{7} = \frac{1}{7}$

4. $\frac{3}{5} \times \frac{5}{6} = \frac{15}{30} = \frac{1}{2}$, or $\frac{\overset{1}{\cancel{3}}}{\cancel{5}} \times \frac{\cancel{5}}{\underset{2}{\cancel{6}}} = \frac{1}{2}$

5. $\frac{5}{12} \times \frac{3}{15}$ $\quad$ **6.** $\frac{4}{9} \times \frac{15}{16}$ $\quad$ **7.** $\frac{3}{7} \times \frac{14}{15}$ $\quad$ **8.** $\frac{8}{11} \times \frac{3}{4}$

9. $\frac{5}{12} \times \frac{12}{15}$ $\quad$ **10.** $\frac{3}{7} \times \frac{7}{15}$ $\quad$ **11.** $\frac{10}{11} \times \frac{8}{15}$ $\quad$ **12.** $\frac{2}{3} \times \frac{9}{10}$

13. $\frac{3}{4} \times \frac{4}{5}$ $\quad$ **14.** $\frac{5}{6} \times \frac{6}{25}$ $\quad$ **15.** $\frac{15}{16} \times \frac{10}{11}$ $\quad$ **16.** $\frac{3}{4} \times \frac{11}{15}$

17. $\frac{3}{5} \times \frac{5}{9}$ $\quad$ **18.** $\frac{8}{15} \times \frac{25}{32}$ $\quad$ **19.** $\frac{7}{14} \times \frac{144}{13}$ $\quad$ **20.** $\frac{7}{8} \times \frac{16}{21}$

164

1. What will $\frac{5}{9}$ of a foot of moulding cost at $\frac{9}{25}$ of a dollar a foot?

2. What will $\frac{8}{15}$ of a yard of lace cost at $\frac{5}{16}$ dollar per yard?

3. What will $\frac{4}{9}$ of a yard of carpet cost at $\$\frac{15}{16}$ per yard?

4. A man owned a $\frac{7}{15}$ interest in a ship and sold $\frac{3}{7}$ of his share. What part of the ship did he sell?

5. Jessie had $\frac{5}{12}$ of a pound of candy and gave away $\frac{3}{4}$ of it. What part of a pound did she give away?

6. Nat has $\frac{3}{4}$ of an acre in his garden. He planted $\frac{8}{9}$ of it in potatoes. What part of an acre of potatoes has he?

7. A man bought a farm for $\frac{19}{20}$ of its real value and sold it for $\frac{20}{27}$ of what he paid for it. What part of the real value of the farm did he sell it for?

8. Tom has to weed $\frac{7}{8}$ of the garden. When he has done $\frac{7}{8}$ of his work, what part of the garden has he weeded?

9. Jack cut $\frac{5}{12}$ of a cord of wood to-day and corded up $\frac{6}{7}$ of what he cut. What part of a cord did he pile up?

10. Scott has $\frac{1}{4}$ as much money as Jack. Jack has $\frac{3}{4}$ as much as Tom. Scott's money is what part of Tom's?

165

1. $\frac{1}{3}\times\frac{2}{3}$	**2.** $\frac{3}{4}\times\frac{3}{5}$	**3.** $\frac{4}{11}\times\frac{3}{5}$	**4.** $\frac{7}{12}\times\frac{5}{9}$
$\frac{2}{3}\times\frac{2}{5}$	$\frac{5}{6}\times\frac{2}{3}$	$\frac{7}{8}\times\frac{5}{6}$	$\frac{3}{11}\times\frac{4}{7}$
$\frac{3}{7}\times\frac{4}{5}$	$\frac{4}{9}\times\frac{5}{7}$	$\frac{7}{8}\times\frac{3}{4}$	$\frac{5}{9}\times\frac{8}{9}$

5. Tim had $\frac{2}{3}$ of a pound of nails. He used $\frac{2}{5}$ of them. What part of a pound did he use?

6. What will $\frac{7}{8}$ of a pound of coffee cost at $\frac{5}{6}$ of a dollar a pound?

7. My ruler was $\frac{5}{6}$ of a yard long. I cut off $\frac{1}{3}$ of it. What part of a yard did I cut off?

8. I bought $\frac{5}{9}$ of a bushel of fruit. $\frac{4}{7}$ of it was apples. What part of a bushel of apples did I buy?

9. It is $\frac{11}{12}$ of a mile to school. If I run $\frac{1}{2}$ of the way, what part of a mile do I run?

10. What will $\frac{3}{4}$ of a yard of silk cost at $\frac{7}{8}$ dollar per yard?

166

1. $1\frac{1}{2}\times 4$	2. $5\times 1\frac{1}{5}$	3. $1\frac{2}{3}\times 6$	4. $1\frac{1}{3}\times 6$
5. $10\times 1\frac{1}{2}$	6. $1\frac{3}{4}\times 12$	7. $1\frac{1}{5}\times 10$	8. $12\times 1\frac{1}{4}$
9. $1\frac{5}{6}\times 24$	10. $1\frac{1}{4}\times 8$	11. $9\times 1\frac{1}{9}$	12. $25\times 1\frac{1}{5}$
13. $1\frac{1}{10}\times 50$	14. $1\frac{9}{10}\times 50$	15. $1\frac{7}{11}\times 22$	16. $1\frac{1}{10}\times 100$
17. $50\times 1\frac{1}{10}$	18. $1\frac{3}{5}\times 20$	19. $1\frac{1}{7}\times 28$	20. $75\times 1\frac{1}{3}$
21. $1\frac{5}{8}\times 16$	22. $1\frac{1}{8}\times 40$	23. $50\times 1\frac{1}{2}$	24. $1\frac{8}{9}\times 27$
25. $25\times 1\frac{4}{5}$	26. $2\frac{1}{2}\times 10$	27. $10\times 2\frac{4}{5}$	28. $75\times 1\frac{2}{3}$
29. $2\frac{1}{3}\times 15$	30. $20\times 2\frac{4}{5}$	31. $40\times 1\frac{5}{8}$	32. $2\frac{1}{7}\times 21$
33. $13\times 2\frac{1}{13}$	34. $49\times 1\frac{5}{7}$	35. $2\frac{1}{5}\times 20$	36. $25\times 2\frac{2}{5}$
37. $56\times 1\frac{2}{7}$	38. $3\frac{1}{6}\times 12$	39. $24\times 2\frac{1}{6}$	40. $18\times 10\frac{2}{3}$

167

1. What will $1\frac{1}{3}$ yards of wire cost at 9 cents a yard?
2. What will 20 buttons cost at $3\frac{1}{2}$ cents apiece?
3. What will 25 yards of carpet cost at $\$\,2\frac{2}{5}$?
4. How many are $3\frac{5}{6}$ dozen?

5. What is the cost of $3\frac{3}{5}$ yards of velvet at $\$5$?

6. How many inches in $1\frac{4}{9}$ yards?

7. Fay is 16 years old. Her father is $2\frac{3}{4}$ times as old as she. How old is her father?

8. It is $2\frac{2}{5}$ miles to my uncle's. How far do I travel in going there and back 20 times?

9. Jack walks $4\frac{2}{3}$ miles an hour. How far does he walk in 15 hours?

10. A man has $7\frac{6}{11}$ acres of land planted with 55 trees to the acre. How many trees has he?

168

1.	2.	3.	4.
$1\frac{1}{2} \times 5$	$1\frac{1}{3} \times 7$	$1\frac{1}{3} \times 10$	$1\frac{1}{4} \times 15$
$2\frac{1}{2} \times 5$	$2\frac{1}{3} \times 7$	$2\frac{1}{3} \times 10$	$2\frac{1}{4} \times 15$
$3\frac{1}{2} \times 5$	$3\frac{1}{3} \times 7$	$3\frac{1}{3} \times 10$	$3\frac{1}{4} \times 15$
$4\frac{1}{2} \times 5$	$4\frac{1}{3} \times 7$	$4\frac{1}{3} \times 10$	$4\frac{1}{4} \times 15$
$5\frac{1}{2} \times 5$	$5\frac{1}{3} \times 7$	$5\frac{1}{3} \times 10$	$5\frac{1}{4} \times 15$

5. What will $5\frac{1}{2}$ pounds of sugar cost at 5 cents?

6. What will $5\frac{1}{3}$ yards of ribbon cost at 10 cents?

7. What will 15 pounds of berries at $3\frac{1}{4}$ cents cost?

8. What will 21 lbs. of coffee at $4\frac{1}{5}$ cents cost?

9. $1\frac{1}{4}$ pounds dried peaches at 22 cents cost how much?

10. 5 quarts of milk at $8\frac{1}{4}$ cents cost how much?

11.	12.	13.
$8\frac{2}{6} \times 3$	$4\frac{2}{3} \times 3$	$2\frac{3}{12} \times 4$
14.	15.	16.
$5\frac{1}{3} \times 9$	$4\frac{1}{9} \times 3$	$5\frac{1}{3} \times 15$
17.	18.	19.
$5 \times 7\frac{2}{5}$	$7\frac{1}{2} \times 4$	$6 \times 2\frac{5}{6}$

20. $6 \times 2\frac{5}{20}$ **21.** $5\frac{2}{3} \times 6$ **22.** $7 \times 3\frac{3}{14}$

23. $10 \times 2\frac{5}{20}$ **24.** $5 \times 9\frac{2}{10}$ **25.** $3 \times 8\frac{2}{9}$

26. $6 \times 2\frac{5}{12}$ **27.** $4 \times 2\frac{3}{8}$ **28.** $7 \times 2\frac{2}{14}$

29. $5\frac{5}{6} \times 3$ **30.** $4\frac{5}{12} \times 4$ **31.** $8\frac{5}{12} \times 6$

32. $3\frac{1}{14} \times 7$ **33.** $4\frac{3}{25} \times 5$ **34.** $3\frac{3}{50} \times 25$

35. What will 15 yards of tape cost at $6\frac{2}{3}$ cents?

36. What will $12\frac{1}{2}$ yards of velvet at \$8 cost?

37. $2\frac{2}{15}$ pounds of sugar at 5 cents cost how much?

38. Shirley walks $3\frac{3}{14}$ miles an hour. How far will he walk in 7 hours?

39. Mary makes a yard of lace in $9\frac{2}{9}$ hours. How long will it take her to make 3 yards?

40. George had $2\frac{2}{21}$ pounds of putty. He used last month 3 times as much as he has now. How much did he use last month?

41. I have $2\frac{6}{16}$ rows of apple trees with 8 trees in a row. How many trees have I?

42. A farmer has $10\frac{9}{10}$ tons of hay worth \$20 per ton. What is his hay worth?

43. At $\$4\frac{5}{16}$ a head what will 4 sheep cost?

44. At 5 cents a pound what will $2\frac{3}{10}$ pounds of candy cost?

169

1. $\frac{1}{3} \times \frac{2}{3} = \frac{2}{9}$
$\frac{1}{7} \times \frac{2}{3}$
$\frac{1}{3} \times \frac{2}{7}$

2. $\frac{2}{3} \times \frac{2}{3}$
$\frac{2}{7} \times \frac{2}{3}$
$\frac{2}{5} \times \frac{2}{7}$

3. $\frac{3}{8} \times \frac{3}{7}$
$\frac{2}{5} \times \frac{2}{3}$
$\frac{3}{5} \times \frac{2}{3}$

4. $\frac{4}{9} \times \frac{2}{3}$
$\frac{5}{7} \times \frac{3}{11}$
$\frac{7}{8} \times \frac{11}{12}$

5. $1\frac{1}{2} \times 1\frac{1}{2} = \frac{\overset{3}{\cancel{3}}}{\underset{2}{\cancel{2}}} \times \frac{\overset{2}{\cancel{4}}}{\underset{3}{\cancel{3}}} = 2$

6. $2\frac{1}{2} \times 1\frac{1}{3}$	7. $2\frac{1}{5} \times 1\frac{1}{3}$	8. $3\frac{1}{3} \times 1\frac{5}{7}$
9. $1\frac{1}{2} \times 2\frac{1}{3}$	10. $2\frac{2}{5} \times 2\frac{2}{3}$	11. $5\frac{2}{3} \times 1\frac{1}{2}$
12. $1\frac{1}{2} \times 1\frac{2}{3}$	13. $1\frac{4}{5} \times 2\frac{1}{4}$	14. $8\frac{2}{3} \times 1\frac{1}{2}$
15. $1\frac{1}{2} \times 2\frac{2}{3}$	16. $2\frac{3}{5} \times 1\frac{3}{4}$	17. $1\frac{1}{3} \times 5\frac{2}{5}$
18. $2\frac{1}{2} \times 2\frac{2}{3}$	19. $1\frac{1}{6} \times 2\frac{1}{2}$	20. $9\frac{1}{2} \times 3\frac{1}{3}$

21. How many quarts of oil will it take to fill $1\frac{1}{2}$ times a jug holding $8\frac{2}{3}$ quarts?

22. What will $2\frac{2}{3}$ yards of silk at $\$2\frac{1}{2}$ per yard cost?

23. I bought lace curtains $5\frac{2}{3}$ feet long at $\$1\frac{1}{2}$ per foot. What did they cost apiece?

24. Sara can hem $1\frac{4}{5}$ yards an hour. How many yards can she hem in $1\frac{2}{3}$ hours?

25. Jack bought for his rabbits $3\frac{1}{2}$ tons of hay at $\$9\frac{1}{2}$ a ton. What did it cost?

26. What will $2\frac{2}{5}$ gallons of ice cream cost at $\$1\frac{3}{4}$?

27. It took $2\frac{1}{2}$ feet of moulding at $10\frac{1}{2}$ cents a foot to make a frame. What did it cost?

28. Tom hoes $4\frac{2}{3}$ rows of corn in an hour. How many rows can he hoe in $1\frac{3}{5}$ hours?

29. At $\$1\frac{1}{3}$ per yard what will $1\frac{1}{3}$ yards of cashmere cost?

30. At $5\frac{1}{4}$ cents a pint what will $3\frac{1}{3}$ pints of berries cost?

170

1. 2 dollars divided between 2 girls allows how much to each?

$\$2 \div 2 = \$1.$ 4 acres $\div 2 = 2$ acres.

2. 6 apples $\div$ 2 = 3 apples. 10 thirds $\div$ 2 = 5 thirds.

3. $\frac{10}{12} \div 2 = \frac{5}{12}$ $\frac{6}{7} \div 2 = \frac{3}{7}$

4. $\frac{4}{9} \div 2$	**5.** $\frac{9}{11} \div 3$	**6.** $\frac{12}{13} \div 6$
7. $\frac{10}{12} \div 2$	**8.** $\frac{9}{12} \div 3$	**9.** $\frac{10}{12} \div 5$
10. $\frac{14}{15} \div 2$	**11.** $\frac{14}{15} \div 7$	**12.** $\frac{15}{16} \div 3$
13. $\frac{15}{16} \div 5$	**14.** $\frac{21}{22} \div 7$	**15.** $\frac{21}{22} \div 3$

16. A father divided $\frac{15}{16}$ of an acre equally among his 3 boys for their gardens. What part of an acre did he allow to each?

17. Mat divided $\$\frac{3}{4}$ equally among 3 small boys. What part of a dollar did each receive?

18. Mary divided $\frac{12}{13}$ of a pound of candy equally among 4 girls. What part of a pound did each receive?

19. I cut $\frac{24}{27}$ of a yard of cloth into 8 equal pieces. How long was each piece?

20. I filled a bottle 3 times from $\frac{3}{16}$ of an ounce of perfumery. How much did the bottle hold?

171

1. $\frac{10}{12} \div 2 = \frac{5}{12}$, or $\frac{10}{24}$. $\frac{10}{24} = \frac{5}{12}$. $\frac{6}{7} \div 3 = \frac{2}{7}$, or $\frac{6}{21}$. $\frac{6}{21} = \frac{2}{7}$.

2. Multiplying the denominator by the integer will give the same result as dividing the numerator by the integer. Dividing the numerator is shorter if it can be done. When this cannot be done, multiply the denominator.

3. $\frac{3}{8} \div 5$	**4.** $\frac{5}{12} \div 6$	**5.** $\frac{5}{7} \div 3$	**6.** $\frac{4}{9} \div 11$
$\frac{4}{9} \div 5$	$\frac{3}{14} \div 2$	$\frac{5}{12} \div 7$	$\frac{5}{11} \div 12$
$\frac{5}{8} \div 3$	$\frac{7}{11} \div 3$	$\frac{8}{15} \div 6$	$\frac{3}{20} \div 7$
$\frac{4}{7} \div 3$	$\frac{8}{15} \div 6$	$\frac{3}{7} \div 5$	$\frac{3}{17} \div 2$
$\frac{5}{6} \div 7$	$\frac{4}{9} \div 3$	$\frac{5}{6} \div 2$	$\frac{4}{15} \div 6$

7.	8.	9.	10.
$\frac{30}{4} \div 6$	$\frac{36}{7} \div 2$	$\frac{36}{7} \div 5$	$\frac{24}{25} \div 5$
$\frac{30}{4} \div 5$	$\frac{36}{7} \div 3$	$\frac{36}{7} \div 7$	$\frac{24}{25} \div 6$
$\frac{30}{4} \div 3$	$\frac{36}{7} \div 4$	$\frac{24}{25} \div 2$	$\frac{24}{25} \div 7$
$\frac{30}{4} \div 10$	$\frac{36}{7} \div 6$	$\frac{24}{25} \div 3$	$\frac{24}{25} \div 8$
$\frac{30}{4} \div 7$	$\frac{36}{7} \div 9$	$\frac{24}{25} \div 4$	$\frac{24}{25} \div 12$

11. I divided $\$\frac{24}{25}$ equally among 4 boys. How much did I give each?

12. $\frac{45}{46}$ of a yard of tape was cut into 5 equal pieces. How long was each piece?

13. A father divided $\frac{27}{29}$ of his property equally among his 3 children. What part did he give each?

14. Edward had $\frac{7}{8}$ of a pound of cherries. He divided them equally among 3 children. What part of a pound did each receive?

15. Norman divided $\frac{3}{4}$ of his garden into 5 equal beds. What part of his garden is each bed?

172

1. If you have \$4 divided into half dollars, how many coins have you? 8 is right.

Then $4 \div \frac{1}{2} = 8$. Now, $4 \times 2 = 8$.

2. If you have \$4 divided into quarters, how many coins do you have? 16 is right.

Then $4 \div \frac{1}{4} = 16$. Now, $4 \times 4 = 16$.

Therefore, $4 \div \frac{1}{2} = 4 \times \frac{2}{1} = 8$. $4 \div \frac{1}{4} = 4 \times \frac{4}{1} = 16$.

Hence, to divide by a fraction, invert the divisor and multiply. [Look in your dictionary for *invert*.]

3. If I give away \$5 in one-dollar pieces, I can give to 5 persons, but if I give only half as much to each person, I can give to twice as many persons; therefore, dividing by one-half is really multiplying by two.

4. \$5 given in dollar pieces can be given to 5 persons; given in quarters it can be given to 20 persons; therefore, if $5 \div 1 = 5$, then $5 \div \frac{1}{4} = 20$, and $5 \times \frac{4}{1} = \frac{20}{1} = 20$.

5. \$$\frac{1}{2}$ given in quarters can be given to how many persons?

$$\frac{1}{2} \div \frac{1}{4} = \frac{1}{\cancel{2}} \times \frac{\overset{2}{\cancel{4}}}{1} = \frac{2}{1} = 2.$$

6. What is true in these cases is true in all others, therefore: To divide by a fraction, invert that fraction and proceed as in multiplication of fractions.

7. $\frac{10}{12} \div 2 = \frac{5}{12}$. This is the same principle, for: $\frac{10}{12} \div 2$ is $\frac{10}{12} \div \frac{2}{1}$, which is $\frac{\overset{5}{\cancel{10}}}{12} \times \frac{1}{\cancel{2}}$, or $\frac{5}{12}$. (Always do the shortest correct method.) (Look for the easiest way.)

8. $\frac{2}{3} \div 2$	**9.** $\frac{10}{12} \div 7$	**10.** $\frac{3}{7} \div 5$	**11.** $10 \div \frac{1}{2}$
$\frac{2}{3} \div \frac{2}{3}$	$\frac{10}{12} \div \frac{1}{2}$	$\frac{4}{9} \div 2$	$25 \div \frac{5}{9}$
$\frac{2}{3} \div \frac{1}{2}$	$\frac{10}{12} \div 2$	$\frac{4}{9} \div \frac{1}{2}$	$12 \div \frac{3}{4}$
$\frac{2}{3} \div \frac{3}{4}$	$\frac{3}{7} \div \frac{1}{2}$	$\frac{4}{9} \div \frac{2}{7}$	$12 \div \frac{5}{6}$
$\frac{10}{12} \div 5$	$\frac{3}{7} \div 3$	$\frac{4}{9} \div \frac{7}{12}$	$20 \div \frac{4}{5}$

12. $\frac{11}{12}$ of his entire crop a farmer sold in 3 equal amounts. What part of his crop was each sale?

13. Change $\frac{3}{7}$ of an inch to the fraction of a foot.

14. Mae made $\frac{4}{9}$ of a yard of ribbon into 6 badges of equal length. How long was each?

15. Rose made $\frac{1}{4}$ of a yard of ribbon into badges $\frac{1}{12}$ of a yard long. How many badges did she make?

16. If it takes $\frac{11}{12}$ of a yard of braid to bind a square mat. How long is one side of the mat?

173

1.	$1\frac{1}{3} \div \frac{1}{2}$	$2\frac{1}{2} \div \frac{1}{3}$	$2\frac{3}{4} \div \frac{2}{3}$	$5\frac{1}{2} \div \frac{2}{3}$
	$1\frac{1}{6} \div \frac{1}{2}$	$2\frac{1}{6} \div \frac{1}{6}$	$1\frac{5}{6} \div \frac{2}{3}$	$2\frac{1}{6} \div \frac{5}{6}$
2.	$1\frac{1}{2} \div 10$	$4\frac{1}{2} \div \frac{1}{3}$	$2\frac{2}{5} \div 5$	$1\frac{2}{11} \div \frac{1}{3}$
	$1\frac{1}{2} \div \frac{3}{10}$	$5\frac{1}{3} \div \frac{1}{4}$	$3\frac{1}{10} \div 4$	$2\frac{2}{5} \div \frac{1}{3}$
3.	$1\frac{1}{2} \div 1\frac{1}{3}$	$5\frac{1}{3} \div \frac{3}{4}$	$4\frac{1}{7} \div \frac{1}{5}$	$7\frac{1}{2} \div \frac{1}{3}$
	$1\frac{3}{5} \div \frac{3}{4}$	$5\frac{1}{6} \div \frac{2}{3}$	$1\frac{2}{3} \div \frac{1}{7}$	$\frac{7}{11} \div \frac{3}{22}$
4.	$1\frac{5}{9} \div 1\frac{1}{2}$	$2\frac{1}{7} \div \frac{3}{7}$	$1\frac{5}{9} \div \frac{1}{2}$	$\frac{18}{20} \div \frac{9}{13}$
	$1\frac{2}{3} \div 1\frac{1}{2}$	$3\frac{3}{5} \div \frac{3}{5}$	$4\frac{1}{2} \div \frac{2}{3}$	$\frac{15}{22} \div \frac{5}{11}$

5. How many times can I fill a bottle holding $\frac{1}{4}$ of a pint from $5\frac{1}{6}$ pints?

6. How many times can I fill a jug holding 1 quart from $7\frac{1}{2}$ gallons?

7. If Susie makes 2 yards of lace in 10 hours, how long will it take her to make 1 yard?

8. If Carrie makes $1\frac{1}{2}$ yards of lace in $9\frac{1}{2}$ hours, how long will it take her to make 1 yard?

9. If Carrie makes $1\frac{1}{2}$ yards of lace in $9\frac{1}{4}$ hours, how much will she make in 1 hour?

10. If Susie makes 2 yards of lace in 10 hours, how much will she make in 1 hour?

11. John can chop $2\frac{1}{2}$ cords of wood in $3\frac{1}{2}$ days. How long will it take him to chop 1 cord?

12. How much can he chop in 1 day?

13. $4\frac{1}{2}$ yards of cloth cost $\$5\frac{3}{4}$. What did 1 yard cost?

14. How much can be bought for $\$1$?

15. $3\frac{1}{4}$ acres of land yield $20\frac{1}{2}$ tons of hay. What does 1 acre yield?

16. What part of an acre yields 1 ton?

17. It takes $4\frac{1}{2}$ days to build $5\frac{1}{2}$ rods of stone wall. How long does it take to build 1 rod?

18. How many rods are built in 1 day?

19. At $\$1\frac{3}{4}$ apiece, how many felt hats cost $\$15\frac{3}{4}$?

20. If a man uses $1\frac{1}{2}$ pounds of flour a day, how long will 50 pounds last him?

21. A fruit man puts $\frac{2}{3}$ of a pound of berries in a box. How many boxes will $12\frac{1}{2}$ pounds fill?

22. When $3\frac{2}{3}$ dozen eggs cost $\frac{3}{5}$ dollar, what is the cost per dozen?

23. How many dozen cost $\$1$?

24. If one book costs $\$\frac{2}{4}$, how many of them will cost $\$5\frac{1}{2}$?

174

1. If you have $\$2$ and give away $\$1$, what part of your money do you give away? Then 1 is what part of 2?

2. 1 is what part of 3? Of 4? Of 5? 10? 12? 15? 20? 25? 50? 100?

3. 2 is what part of 3? Of 4? Of 5? 7? 18? 20? 30? 45? 50? 100?

4. 3 is what part of 4? Of 5? Of 6? 9? 15? 24? 25? 75? 80? 100?

5. 5 is what part of 10? Of 11? Of 15? 20? 25? 30? 70? 75? 100?

6. 10 is what part of 30? 40? 45? 50? 60? 75? 100? 150? 200?

7. A man had 45 sheep and sold 10. What part of his sheep did he sell?

8. In a farm of 30 acres 25 acres are in fruit trees. What part of the farm is in fruit?

9. Out of 50 eggs 5 were bad. What part was bad?

10. Max had on his kite a tail 20 feet long. What part of it did he lose when 3 feet of it broke off?

11. A certain flag-pole is 60 feet high. The flag is lowered 9 feet from the top. What part of the pole is above the flag?

12. A tree was 36 feet tall. Lightning struck it and broke off 8 feet. What part was broken off?

13. Carl had \$5 and spent \$ $2\frac{1}{2}$. What part of his money did he spend?

14. A dressmaker has 11 yards of lace for trimming a waist. When she has used $5\frac{1}{2}$ yards, what part of it has she used?

15. A boy bought a bicycle for \$45. When he had paid \$25, what part had he paid?

16. 10 inches are what part of a foot?

17. 9 ounces are what part of a pound?

18. 60 days are what part of 2 years?

19. 9 months are what part of a year?

20. 10 months are what part of 2 years?

21. 16 hours are what part of 2 days?

22. 27 inches are what part of a yard?

23. 75 cents is what part of \$1.50?

24. 9 eggs are what part of 5 dozen eggs?

25. 10 cents is what part of \$2? \$20?

26. 55 minutes are what part of an hour?

27. 72 years are what part of a century?

28. 18 is what part of a score?

29. 3 dozen are what part of 4 score?

30. 4 score and 10 years are what part of a century?

31. $1.25 is what part of $2.50?

32. $1.25 is what part of $5.00?

33. $12.50 is what part of $25.00?

34. $1.50 is what part of $4.50?

35. $7.50 is what part of $15?

36. $.25 is what part of $25.00?

37. $2.50 is what part of $25.00?

38. $25 is what part of $200?

39. $\frac{1}{4}$ is what part of $\frac{1}{2}$?

40. $\frac{1}{4}$ is what part of $\frac{3}{4}$?

41. $12\frac{1}{2}$ is what part of 100?

42. $37\frac{1}{2}$ is what part of 100?

43. $12\frac{1}{2}$ is what part of $37\frac{1}{2}$?

44. $37\frac{1}{2}$ is what part of $62\frac{1}{2}$?

45. $12\frac{1}{2}$ is what part of $62\frac{1}{2}$?

Re-write this exercise as examples in division.

46. $12\frac{1}{2}$ is what part of 25? Of 50?

47. What part of 10 is $3\frac{1}{3}$? $6\frac{2}{3}$?

48. $5\frac{1}{2}$ is what part of $16\frac{1}{2}$?

49. 1 is what part of 10? Of 1000?

50. $\frac{1}{2}$ is what part of 10? Of 16?

175

1. 6 is $\frac{1}{3}$ of what?
2. 7 is $\frac{1}{4}$ of what?
3. 10 is $\frac{1}{2}$ of what?
4. 9 is $\frac{1}{7}$ of what?
5. 12 is $\frac{1}{12}$ of what?
6. 7 is $\frac{1}{8}$ of what?
7. 9 is $\frac{1}{6}$ of what?
8. 15 is $\frac{1}{4}$ of what?
9. 12 is $\frac{1}{9}$ of what?
10. 20 is $\frac{1}{20}$ of what?
11. 4 is $\frac{1}{12}$ of what?
12. 25 is $\frac{1}{4}$ of what?
13. 17 is $\frac{1}{2}$ of what?
14. $5\frac{1}{2}$ is $\frac{1}{2}$ of what?
15. $2\frac{1}{2}$ is $\frac{1}{3}$ of what?

176

1. Scott spent $\$2\frac{1}{2}$, which was $\frac{1}{2}$ of what he had. How much had he at first?

2. 12 square inches are $\frac{1}{12}$ of a square foot. How many square inches in a square foot?

3. $5\frac{1}{2}$ feet are $\frac{1}{3}$ of a rod. How many feet in a rod?

4. Bert walked 7 miles, which was $\frac{1}{3}$ of the distance from his home to town. How far did he live from town?

5. A dairyman bought 5 cows, which were $\frac{1}{9}$ as many as he already had. How many had he at first?

6. 15 years is $\frac{1}{3}$ of my father's age. How old is he?

7. 21 days are what part of the month of April?

8. A merchant sold cloth so as to gain 15 cents, which was $\frac{1}{5}$ of the cost. What was the cost?

9. Roy sold his bicycle at $\$10$ below cost, thereby losing $\frac{1}{3}$ of the cost. What was the cost?

10. 20 pounds are $\frac{1}{6}$ of my weight. What do I weigh?

177

1. 8 is $\frac{2}{3}$ of what? $8 \div \frac{2}{3} = 8 \times \frac{3}{2} = 12.$

If 8 is 2 thirds, 1 third is $\frac{1}{2}$ of 8, or 4, and 3 thirds are 3×4, or 12.

Analyze:

2. 8 is $\frac{2}{5}$ of what number?

3. 9 is $\frac{3}{5}$ of what number?

4. 10 is $\frac{5}{6}$ of what number?

5. 12 is $\frac{3}{4}$ of what number?

6. 14 is $\frac{7}{10}$ of what number?

7. 15 is $\frac{3}{8}$ of what number?

8. 16 is $\frac{4}{9}$ of what number?

9. 18 is $\frac{9}{10}$ of what number?

10. 24 is $\frac{8}{11}$ of what number?

11. 24 is $\frac{6}{7}$ of what number?

12. 24 is $\frac{3}{4}$ of what number?

13. 24 is $\frac{4}{9}$ of what number?

14. 30 is $\frac{10}{11}$ of what number?

15. 75 is $\frac{3}{4}$ of what number?

16. 80 is $\frac{4}{5}$ of what number?

17. 72 is $\frac{8}{9}$ of what number?

18. 144 is $\frac{12}{7}$ of what number?

19. 132 is $\frac{11}{10}$ of what number?

20. 108 is $\frac{9}{10}$ of what number?

21. 100 is $\frac{1}{10}$ of what number?

State again as examples in division.

178

1. I sold a cow for \$72, which was $\frac{9}{10}$ of what I paid for her. What did she cost?

2. A furniture dealer gained \$6 on the sale of a set of furniture, which was $\frac{2}{21}$ of the cost. What was the cost?

3. When Jane is 12 years old she will be $\frac{3}{11}$ as old as her mother is now. How old is her mother?

4. 12 cubic feet are $\frac{4}{9}$ of a cubic yard. How many cubic feet in a cubic yard?

5. 60 square inches are $\frac{5}{12}$ of a square foot. How many square inches in 1 sq. ft.?

6. I have 96 cu. ft. of wood. This is $\frac{3}{4}$ of a cord. How many cubic feet in 1 cord?

7. If 49 rods is $\frac{7}{10}$ of the distance around a field, how many rods of fence will inclose the field?

8. I have 24 yards of matting. It will cover $\frac{8}{9}$ of my floor. How many yards more must I buy?

9. $\frac{4}{5}$ of 45 is $\frac{9}{10}$ of what?

10. $\frac{3}{4}$ of 80 is $\frac{5}{11}$ of what?

DECIMALS

179

Read these decimal fractions:

[Be sure to sound *ths* and *dths*.]

1. Tenths: **2.** Hundredths:

.5	.25	.16	.63	.04	.52	.38
.8	.50	.19	.66	.01	.47	.52
.3	.75	.18	.72	.03	.95	.85
.1	.45	.13	.81	.08	.34	.09

3. Thousandths:

.125	.963	.205	.025	.005	.040	.112
.258	.289	.401	.067	.007	.004	.375
.315	.417	.803	.018	.002	.104	.012
.429	.211	.605	.042	.004	.400	.009

4. .75, .009, .5, .05 .005, .017, .125, .304, .9, .7, .07, .007, .485, .085, .805, .850, .419, .08, .8.

5. Ten-thousandths:

.3275	.1049	.0375	.0045	.0103	.0008
.5037	.9957	.0258	.0027	.0560	.0005
.2348	.8304	.0401	.0018	.0702	.0101
.3705	.1825	.0725	.0075	.0003	.0004

6. Hundred-thousandths:

.27285	.07423	.00842	.01007	.10058
.49407	.01247	.00705	.04703	.10005
.12025	.02734	.00203	.02005	.70302
.58003	.01375	.00420	.08009	.08704

7. .037, .0025, .19, .009, .18275, .028, .80307, .4901, .4, .004, .00015, .75075, .0075, .00075.

180

1. How many decimal places are required for tenths? For hundredths? For thousandths? For ten-thousandths? For hundred-thousandths?

2. What is the third place to the right of the decimal point called? The fourth? The first? The second? The fifth?

Read these decimal fractions, or decimals:

3. Millionths:

.000005	.007125	.290204	.000875
.000025	.027125	.075008	.087500
.000125	.427125	.840005	.008750

4. .0317, .29, .70203, .839, .001275, .02, .00002, .76, .01, .003, .39152, .1752, .017017.

181

1. What is the name of the fourth place? The fifth? The sixth?

2. How many places are required to write millionths?

3. What is the name of the place next after millionths?

4. How many places are required to write ten-millionths?

5. Read the decimals described as follows:

Point, two, five. Point, nought, seven, five. Point, eight, nought, five, nine. Point, four, two, nought, five. Point, nought, nought, seven, three. Point, eight, nought, one.

Read these decimal fractions:

6.	7.	8.	9.	10.	11.
.5	.05	.005	.0005	.00005	.12$\frac{1}{2}$
.2	.02	.002	.0002	.00002	.87$\frac{1}{2}$
.9	.19	019	.0019	.00019	.08$\frac{1}{3}$
.7	.28	.028	.0028	.00028	.14$\frac{2}{7}$
.8	.08	.175	.0175	.00175	.06$\frac{1}{4}$
.3	.25	.025	.1275	.01275	.33$\frac{1}{3}$
.4	.04	.004	.2704	.21735	.66$\frac{2}{3}$
.1	.003	.0001	.2107	.575	.11$\frac{1}{9}$
.01	.303	.0017	.2115	.6830	.09$\frac{1}{11}$
.11	.033	.0175	.37$\frac{1}{2}$	.511	.55$\frac{5}{9}$
.011	.625	.2175	.62$\frac{1}{2}$	.011	.28$\frac{4}{7}$
.511	.875	.2017	.83$\frac{1}{3}$	.001	.37$\frac{1}{2}$
.001	.375	.2007	.16$\frac{2}{3}$	.111	.62$\frac{1}{2}$

Read these mixed numbers:

12.	13.	14.
$1.12\frac{1}{2}$	1.000005	9.4
$1.62\frac{1}{2}$	1.000007	5.075
$3.33\frac{1}{3}$	17.000009	11.004
$5.87\frac{1}{2}$	19.00006	6.0025
12.05	21.0008	12.1001
$25.08\frac{1}{3}$	11.000018	3.1416
75.0075	7.000175	8.2525
$2.66\frac{2}{3}$	4.001275	$4.66\frac{2}{3}$
59.059	9.025249	$5.37\frac{1}{2}$
10.003	1.256207	$7.062\frac{1}{2}$

182

Addition: [Keep points in a straight line.]

1.	2.	3.	4.	5.	6.
.1	.25	.37	.015	.3	.18
.3	.12	.03	.003	.2	.25
.4	.27	.18	.104	.1	.37
.1	.08	.32	.375	.1	.14

7.										
.7	.9	.6	.5	.7	.6	.6	.9	.9	.09
.8	.3	.7	.8	.7	.8	.5	.6	.9	.09

8.										
.07	.09	.06	.05	.07	.06	.06	.09	.08	.05
.08	.03	.07	.08	.07	.08	.05	.06	.03	.05

9.										
.25	.37	.18	.03	.17	.75	.82	.37	.15	.65
.05	.14	.19	.55	.18	.13	.02	.35	.25	.25

10.										
.75	.85	.64	.29	.47	.18	.49	.37	.56	.65
.25	.15	.55	.91	.97	.87	.57	.78	.56	.65

11.	.003	.017	.125	.358	.063	.955	.725
	.005	.018	.075	.724	.847	.055	.825

12.	.25	.25	.025	.025	.025	.25	.025	.025	.025	.75
	.5	.05	.5	.05	.005	.25	.025	.25	.0025	.75

13.	.75	.75	.75	.075	.005	1.25	1.25	3.45	146.25
	.25	.5	.05	.05	.075	.5	.75	.77	13.75

14	15	16	17	18	19	20	21	22	23
.5	.8	.05	.08	.15	13.5	.09	4.4	.14	.9
.3	.9	.03	.09	.17	.6	.11	.7	.04	.3
.7	.1	.07	.01	$.12\frac{1}{2}$	.5	.13	.15	.11	.4
.5	.5	.05	.05	.13	1.3	.03	.5	1.01	.7
.6	.6	.06	.06	.05	1.5	.14	.1	.5	.6
.9	.2	.09	.02	$.07\frac{1}{2}$	.41	.5	.7	$1.12\frac{1}{2}$	.8

183

Subtraction: [Keep points in a straight line.]

1.	1.00	1.25	1.00	1.00	1.00	1.00	1.00	.75
	.05	.75	$.87\frac{1}{2}$	$.37\frac{1}{2}$	$.66\frac{2}{3}$	$.01\frac{1}{2}$	$.08\frac{1}{3}$	.005

2.	.875	.5	1.00	1.00	.95	$.87\frac{1}{2}$	$.66\frac{2}{3}$	.63
	.5	.05	.625	$.12\frac{1}{2}$	.095	$.37\frac{1}{2}$	$.33\frac{1}{3}$	.025

3.	2.00	3.50	5.00	15.25	25.25	.875	150.
	1.75	1.75	2.175	8.125	9.50	$.66\frac{2}{3}$	$.66\frac{2}{3}$

4.	17.00	100.50	100.	100.	7.	10.	75.75
	.875	13.625	$66.0\frac{2}{3}$	66.75	.55	1.85	9.85

184

Multiplication: [Point off, from the right in the product, as many decimal places as there are in both multiplier and multiplicand.]

1	2	3	4	5	6	7	8	9
.25	.9	.09	.09	.09	9	2.5	.12	1.2
.5	.8	.8	.08	.8	.8	.5	.8	.8
12	12	12	.25	.001	.001	.001	1.00	2.5
.8	.8	.08	.05	5	.5	.05	.05	.05
.125	.125	1.25	12.5	25	.125	1.25	12.5	125
8	.8	.8	.8	.5	.08	.08	.08	.08
2.5	25	75	56	56	1.5	1.5	15	.15
.5	.01	.001	.1	.01	.5	.05	.5	.05

185

Division: [Point off from the right in the quotient, as many decimal places as those in the dividend exceed those in the divisor. *Exceed* means, *are greater than.*]

1	2	3	4	5	6
1).1	1).01	.1).1	.1).01	.1).001	.01)1.00
.01).10	.01)1.10	.01).001	.5)2.5	.5)25	.5).25
5)25	5)2.5	5).25	5).025	.05).025	.005).025
8)1.00	12)1.00	3)1.00	8)64	8).64	.8)64
.8).64	.3)2.7	5).16	.02)1.3	.07)14	.25)100
.1)18	.1)1.8	.1).18	1)1.8	.01)1.8	.01)18

186

Some reasons why:

1. Addition: $\frac{1}{10}+\frac{1}{10}=\frac{2}{10}$. Therefore, $.1+.1=.2$.

Hence; $\begin{array}{r} .1 \\ .1 \\ \hline .2 \end{array}$ and the rule for pointing off the sum.

2. Subtraction: $\frac{7}{10}-\frac{5}{10}=\frac{2}{10}$. Therefore, $.7-.2=.5$.

Hence; $\begin{array}{r} .7 \\ .2 \\ \hline .5 \end{array}$ and the rule for pointing off the remainder.

3. Multiplication: $\frac{3}{10}\times\frac{4}{10}=\frac{12}{100}$. Therefore, $.3\times.4=.12$.

Hence; $\begin{array}{r} .3 \\ \times .4 \\ \hline .12 \end{array}$ and the rule for pointing off the product.

Memorize rule.

4. Division: $\frac{25}{1000}\div\frac{5}{10}=\frac{\overset{5}{\cancel{25}}}{\cancel{1000}}\times\frac{\cancel{10}}{\cancel{5}}=\frac{5}{100}$. Therefore, $.025\div.5=.05$.

Hence; $.5\overline{).025}$ $\over$ $.05$ and the rule for pointing off the quotient.

Memorize rule.

Prove many examples in division of decimals.

5. Would you rather have \$100. or \$1.00 or \$.100?

Remember that the decimal point is powerful, and learn to place it right.

187

UNITED STATES MONEY

10 mills make 1 cent.
10 cents make 1 dime.
10 dimes make 1 dollar.
10 dollars make 1 eagle.
20 dollars make 1 double-eagle.

1. Why is this a very easy table with which to work?

2. What is such a system called?

This is an easy table to work with because the scale is 10. Such a system is called a decimal system, from a word in Latin which means *ten*.

3. Why is a decimal system easy?

Because changing to higher or lower denominations requires only the moving of the decimal point.

4. Multiply each of these numbers by 10, then by 100, then by 1000. Describe resulting numbers; as, 1, 5, 7, 0, point, and read:

5.	20.	157.	$1250.	$ 2.50	$ 5.25	$ 1.12½
7.	25.	239.	$3295.	$17.40	$ 6.75	$ .37½
3.	13.	560.	$1627.	$11.90	$13.96	$ 5.62½
8.	70.	942.	$4274.	$ 8.70	$ 7.85	$ .66⅔
4.	68.	729.	$2875.	$10.20	$44.47	$10.87½

RULE. — To multiply by 1 with any number of ciphers move the decimal point as many places to the right as there are ciphers in the multiplier.

5. Division is always the opposite operation to multiplication. Make the rule for dividing by 1 with any number of ciphers.

Divide these numbers by 10, 100, 1000. Describe resulting numbers ; as, point, 1, 2, 5, and read :

1.25	27.35	.875	15.009	3.0275
7.36	9.72	.027	24.1235	.864
11.45	55.13	.5	149.25	17.8
25.25	1.75	1.2	14.8	3.005
7.50	20.95	.145	27.02	26.75

188

Change these decimal fractions to common fractions :

1.	2.	3.	4.
$.1=\frac{1}{10}$	$.25=\frac{25}{100}=\frac{1}{4}$	$.40=\frac{40}{100}=\frac{2}{5}$	.24
$.5=\frac{5}{10}=\frac{1}{2}$	.50	.80	.55
.3	.75	.90	.65
.7	.45	.70	.66
.9	.95	.10	.02
.8	$.05=\frac{5}{100}=\frac{1}{20}$	.60	.78
.6	.85	.30	.88
.4	.01	.40	.42
.2	.04	.20	.56

[Notice number of ciphers in denominator.]

5.	6.	7.	8.
$.125=\frac{125}{1000}=\frac{1}{8}$	.244	$.0005=\frac{5}{10000}=\frac{1}{2000}$	.0125
.275	.175	.0025	.0375
.025	.225	.375	.1125
.005	.625	.0075	.0625
.075	.875	.1275	.0875
.1375	.475	.0625	.2225

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Change these common fractions to decimal fractions:

1. [These are easy if you think of dollars and cents.]

$\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{10}$, $\frac{3}{10}$, $\frac{8}{10}$, $\frac{9}{10}$, $\frac{1}{20}$, $\frac{3}{20}$, $\frac{7}{20}$, $\frac{9}{20}$, $\frac{11}{20}$, $\frac{13}{20}$, $\frac{17}{20}$, $\frac{19}{20}$, $\frac{1}{50}$, $\frac{3}{50}$, $\frac{7}{50}$, $\frac{9}{50}$, $\frac{11}{50}$, $\frac{13}{50}$, $\frac{17}{50}$, $\frac{19}{50}$, $\frac{1}{25}$, $\frac{2}{25}$, $\frac{3}{25}$, $\frac{4}{25}$, $\frac{2}{25}$, $\frac{4}{25}$, $\frac{5}{25}$, $\frac{6}{25}$, $\frac{7}{25}$.

[Reduce these to lowest terms before changing.]

$\frac{2}{4}$, $\frac{14}{20}$, $\frac{2}{20}$, $\frac{3}{30}$, $\frac{4}{40}$, $\frac{5}{50}$, $\frac{18}{20}$, $\frac{7}{70}$, $\frac{10}{20}$, $\frac{8}{80}$, $\frac{9}{90}$, $\frac{6}{20}$.

2. [Reduce these to lower terms; to fractions having for denominators, 1 with one or more ciphers.]

$\frac{4}{20}$, $\frac{8}{20}$, $\frac{12}{20}$, $\frac{16}{20}$, $\frac{20}{50}$, $\frac{40}{50}$, $\frac{30}{50}$, $\frac{8}{40}$, $\frac{12}{60}$, $\frac{35}{50}$, $\frac{56}{80}$.

3. You see, it is sometimes easier to change to *lowest* terms and sometimes to *lower* terms before changing to a decimal. Usually, however, the fraction must be changed to *higher* terms, but always to a fraction having a decimal denominator. What is a decimal denominator? (See No. 2.)

Be careful, after you have changed to a fraction with a decimal denominator and then have written the numerator of this fraction for the decimal, to make as many decimal places as there are ciphers in the denominator. Suppose you have the fraction, $\frac{17}{1000}$; make the three decimal places by writing, point, nought, one, seven, .017.

4. [Change to higher terms and then to decimals.]

$\frac{17}{20\times ?}=\frac{\quad}{100}$. $\frac{17}{20\times 5}=\frac{\quad}{100}$. Therefore, $\frac{17\times 5}{20\times 5}=\frac{85}{100}=.85$.

Why must you multiply the numerator by same number by which you multiply the denominator?

$\frac{18}{250\times?}=\frac{\quad}{1000}$. $\frac{18}{250\times 4}=\frac{\quad}{1000}$. Therefore, $\frac{18\times 4}{250\times 4}=\frac{72}{1000}=.072$.

$\frac{19}{20}$, $\frac{11}{20}$, $\frac{13}{20}$, $\frac{7}{20}$, $\frac{9}{20}$, $\frac{3}{20}$, $\frac{17}{20}$, $\frac{11}{50}$, $\frac{21}{50}$, $\frac{27}{50}$, $\frac{33}{50}$, $\frac{49}{200}$, $\frac{23}{250}$, $\frac{27}{500}$, $\frac{17}{125}$, $\frac{18}{125}$, $\frac{22}{125}$, $\frac{36}{125}$, $\frac{52}{125}$, $\frac{34}{125}$.

[Sometimes the multiplier is a mixed number.]

$\frac{11}{30}\times 3\frac{1}{3}=\frac{\quad}{100}=?$ $\frac{3}{40}\times 2\frac{1}{2}=\frac{\quad}{100}=?$ $\frac{1}{8}\times ?=\frac{\quad}{1000}=?$

$\frac{3}{8}=?$ $\frac{5}{8}=?$ $\frac{7}{8}=?$

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1. What is a decimal?
2. What is a decimal denominator?
3. What is a decimal system?
4. What must be observed in writing fractions to add or subtract?
5. What is the rule for pointing off the sum?
6. What is the rule for pointing off the difference, or remainder?
7. How is the product pointed off?
8. How is the quotient pointed off?
9. Moving the point to the right does what to the decimal?
10. Moving the point to the left does what to the decimal?
11. What does *exceed* mean?
12. Make a list of as many cautions concerning decimals as you can.

13. Read:

.08, .270275, .0075, .00015, .017, $1.33\frac{1}{3}$, $.06\frac{1}{4}$, 150.015, $.14\frac{2}{7}$, 25.0025.

14. Read as decimals:

$\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{5}$, $\frac{2}{5}$, $\frac{3}{5}$, $\frac{4}{5}$, $\frac{1}{8}$, $\frac{2}{8}$, $\frac{3}{8}$, $\frac{4}{8}$, $\frac{5}{8}$, $\frac{7}{8}$, $\frac{3}{10}$, $\frac{5}{10}$, $\frac{7}{10}$, $\frac{9}{10}$, $\frac{1}{50}$, $\frac{1}{25}$, $\frac{24}{25}$, $\frac{1}{200}$, $\frac{3}{500}$, $\frac{1}{40}$.

15. Read as common fractions in lowest terms:

.5, .4, .75, .25, .50, .125, .625, 1.75, 5.25, .85, 7.05, .95, 065, .0046, 11.875, $.12\frac{1}{2}$, .375.

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Here are some other decimals which you must use so often that you should learn their equivalent common forms.

1. $.33\frac{1}{3}=\frac{1}{3}$ $.66\frac{2}{3}=\frac{2}{3}$

Multiply these numbers by $.33\frac{1}{3}$ and by $.66\frac{2}{3}$:

24	60	150	27	120	69	165	36	300	18
90	42	27	51	399	48	30	45	96	78
330	20	39	84	240	600	180	57	21	54
900	150	480	576	213	195	1200	1500	2400	1800

2. $.16\frac{2}{3}=\frac{1}{6}$ $.83\frac{1}{3}=\frac{5}{6}$

Multiply by $.16\frac{2}{3}$:

24	36	18	54	240	60	600	48	84	480
96	150	120	72	360	240	300	90	78	270
900	330	30	576	180	42	1200	2400		

3. $.14\frac{2}{7}=\frac{1}{7}$

Multiply by $.14\frac{2}{7}$:

35	21	70	84	14	91	6	28	42	7
56	98	350	700	840	560	140	364	777	637
581	420	630	294	854	427	448	140	1400	2100

4. Multiply by $.11\frac{1}{9}$ ($\frac{1}{9}$):

27	18	210	549	1800	45	54	180	648	2700
63	90	540	828	4500	81	99	900	999	1080
36	72	720	558	9000	549	630	6300	369	

5. Multiply by $.9\frac{1}{11}$ ($\frac{1}{11}$):

55	77	22	550	132	33	66	44	330	143
88	99	121	440	1100					

6. Find $.08\frac{1}{3}$ ($\frac{1}{12}$) and $.16\frac{2}{3}$ ($\frac{1}{6}$) of these numbers:

72	600	1200	24	20	200	2000
108	360	3000	12	18	180	1800
84	240	8400	96	30	300	30000
36	120	4800	132	25	250	2500

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1. $.12\frac{1}{2}$ is what part of .25? $.37\frac{1}{2}$? .50? $.62\frac{1}{2}$? $.87\frac{1}{2}$?
2. $.37\frac{1}{2}$ is what part of .50? $.62\frac{1}{2}$? $.87\frac{1}{2}$? What decimal?
3. $.08\frac{1}{3}$ is what part of $.16\frac{2}{3}$? $.33\frac{1}{3}$? $.66\frac{2}{3}$? What decimal?
4. $.16\frac{2}{3}$ is what part of $.33\frac{1}{3}$? $.66\frac{2}{3}$? What decimal?
5. $.33\frac{1}{3}$ is what part of $.66\frac{2}{3}$? What decimal?
6. $.37\frac{1}{2}$ is what part of $.87\frac{1}{2}$? What decimal?
7. $.62\frac{1}{2}$ is what part of $.87\frac{1}{2}$? What decimal?
8. .25 is what part of .5? What decimal?
9. $.12\frac{1}{2}$ is what part of .5? What decimal?
10. $.16\frac{2}{3}$ is what part of $.83\frac{1}{3}$? What decimal?

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1. What is .75 of \$24? Of \$40? Of \$120? .25 of \$1.60? Of \$80?
2. What is $.66\frac{2}{3}$ of \$60? Of 60 acres? Of 6 acres? Of \$100?

3. $25 is .5 of what? Is .25 of what? Is .05 of what?

4. 15 is .12½ of what? 12 is .12½ of what? .75 of what?

5. 15 is what decimal of 45? Of 60? Of 75? Of 150?

6. 25 is what decimal of 75? Of 50? Of 100? Of 250?

7. I owned 40 acres of land and sold .25 of it. How many acres did I sell?

8. A merchant bought cloth at $5 per yard and sold it so as to gain $1. What decimal of the cost did he gain?

9. A commission merchant charged me .11 of the money for collecting $100. How many dollars did he charge?

10. I gained $7 on the sale of a cow. This was .14⅔ of what she cost me. What did she cost?

11. A hardware merchant sold basins for 60 cents, which was .66⅔ of the cost. What was the cost?

12. I owned .75 of a mine. I sold .5 of the mine to one man and .05 of it to another. What did I still own?

13. I owned .75 of a mine and sold .5 of my share. What part of the mine did I sell?

14. Otis had 15 pigeons. He sold .33⅓ of them. How many did he sell?

15. Jack bought 15 hens, which were .6 of what he already had. How many had he at first?

16. Lois hemmed 9 yards last week. To-day she hemmed .33⅓ as much. How much did she hem to-day?

17. 25 miles is .5 of the distance from Mary's home to the city. How far is it to the city?

18. .11⅑ of 36 is .5 of what number?

19. I bought three yards of ribbon at $.05. This was .25 of my entire bill. What was my bill?

20. Milton bought a bicycle for $40. When he has paid $30 he will have paid what decimal part of the price?

21. A man owns .5 of a pasture and sells .1 of his share. What part of the pasture does he sell?

22. What is .01 of $90? .01 of $900? .01 of $9? Of 9 bushels?

23. What is .1 of $90? .2 of $90? .3 of $90? .3 of $9?

24. What is the quotient of 57.5 divided by .5? Of $100 \div .5$?

25. What is the product of $.7 \times .3$? $.8 \times .9$? $.8 \times 9.$? $.8 \times .09$? $.08 \times .09$?

26. .875 is equal to what common fraction? .625? .125? $.66\frac{2}{3}$?

27. $1\frac{1}{2}$ is what decimal of 3? $2\frac{1}{2}$ of 10? 3 of 9? 15 of 20?

28. .25 of 20 + .75 of 16 are how many?

29. $.33\frac{1}{3}$ of 36 is .5 of what number?

30. Add: .2 of 20 and .5 of 30 and $.12\frac{1}{2}$ of 64.

194

After reading and working as here given, re-read, if possible, substituting common fractions for decimals and decimals for common fractions.

1. A man has a journey of 75 miles to perform. When he has gone $\frac{1}{15}$ of it and $\frac{2}{5}$ of it, how many miles has he still to go? What part has he still to go?

2. A boy spent $\frac{1}{2}$ of his money and had $3 left. How much had he at first?

3. Amos spent $\frac{1}{2}$ of his money and $\frac{1}{3}$ of it and then he had $7 left. How much had he at first?

4. Arnold spent $\frac{1}{2}$ of $\frac{2}{3}$ of his money and had $10 left. How much money had he at first?

5. There were 48 pupils in a class. 3 of them were absent. What part was absent?

6. .75 of a class of 44 were promoted. How many were not promoted?

7. .25 feet are what decimal part of 100 feet?

8. 1 foot is what decimal of a yard? Of 2 yards?

9. A newsboy buys papers for 3 cents and sells them for 5 cents. His gain is what part of the cost?

10. What will $\frac{1}{4}$ of 40 yards of cloth cost at $\$\frac{7}{8}$ per yard?

11. What will $\frac{2}{7}$ of a yard of silk cost at $\$1\frac{1}{2}$ per yard?

12. If it takes 5 men 3 days to do a piece of work, how long will it take 6 men to do it?

13. If it takes 8 men 3 days to do a piece of work, how many men could do it in 4 days?

14. Lee chopped $2\frac{1}{2}$ cords of wood last week, which was .5 of what he chopped the week before. How much did he chop in the two weeks?

15. When eggs are $\$\frac{3}{20}$ per dozen, how many dozen can be had for $1.50?

16. If 10 acres of land produce 15 tons of hay, how much will 24 acres produce?

17. If 12 acres produce 20 tons of hay, how many acres will it take to produce 30 tons?

18. At $\$\frac{4}{5}$ apiece, what will 25 chairs cost?

19. At $\$.66\frac{2}{3}$ apiece, how many chairs can be bought for $\$12$?

20. Tom spent $\frac{1}{3}$ of his money for stamps, 10 cents for paper, and had $\frac{1}{3}$ of it left. How much did he spend for stamps?

21. John can do a piece of work in 6 days, Jack can do it in 8 days. How long will it take the two working together to do it?

22. Mary and Louise working together can make a dress in 4 days. Mary can do it alone in 6 days. How many days would it take Louise alone to make it?

23. In a box were 100 oranges. .08 of them decayed. How many sound ones were left?

24. $\frac{5}{9}$ of the distance around a field is 35 rods. What is the distance around it?

25. A man having spent $.66\frac{2}{3}$ of his money has $\$50$ left. What had he at first?

26. At $\$\frac{4}{5}$ a yard, how many yards of silk will cost $\$1\frac{1}{2}$?

27. A wheel in turning round goes $1\frac{1}{3}$ yards. How many times must it turn to go 5 yards?

28. $16\frac{2}{3}$ is what part of 100?

29. What is $\frac{1}{7}$ of 100? $\frac{1}{12}$? $\frac{1}{11}$? $\frac{1}{9}$? $\frac{1}{8}$? $\frac{7}{8}$? $\frac{1}{6}$? $\frac{5}{6}$?

30. 40 pounds is .25 of a certain man's weight. What is his weight?

31. If I buy cloth at $\$.25$ and sell it at .2 advance on the cost, for what do I sell it?

32. A can do a piece of work in 2 days, B in 3 days, C in 4 days. How long will it take the three together?

33. A can do a piece of work in 10 hours, B in 12 hours, C in 20 hours. How long will it take the three together?

34. A can do a piece of work in 3 weeks, B in 5 weeks, and C in 6 weeks. How long will it take A, B, and C together?

35. I spent $\frac{3}{8}$ of my money for board, $\frac{1}{6}$ for traveling expenses, and then had $55 left. How much had I at first?

36. Max paid $\frac{1}{2}$ of his week's wages for board and put $\frac{1}{3}$ of it in the bank. He had $2 still in his purse. What were his wages?

37. In a class of 32 pupils $.12\frac{1}{2}$ were absent. How many were present?

38. Last evening I read 120 pages in a book of 360 pages. What decimal part of the book did I read?

39. $37\frac{1}{2}$ is what part of 100? $83\frac{1}{3}$ is what part of 100?

40. At the rate of 3 for a quarter, how many ball bats can be bought for $\$3\frac{1}{2}$?

41. Two men start from a certain point and travel in opposite directions, one at the rate of $5\frac{1}{2}$ miles per hour, the other at the rate of $7\frac{1}{2}$ miles per hour. How long will it take them to be 85 miles apart?

42. Joel had $\$5\frac{1}{2}$ left after paying three bills, respectively, $\$7\frac{1}{2}$, $.75, and $\$3\frac{3}{4}$. How much had he before paying his bills?

43. It costs 20 cents per box to import foreign oranges. What will it cost to import 150 boxes?

44. A collector receives .05 of all the money he collects. How much must he collect to earn $15?

45. .16$\frac{2}{3}$ of \$72 is what decimal of \$120? What is .12$\frac{1}{2}$ of 84?

46. 8 × $\frac{1}{2}$ of 40 is .8 of what? What is .66$\frac{2}{3}$ of \$20?

47. 3.5 × .5 + .3 = ? \$7.50 is .33$\frac{1}{3}$ of what?

48. What is .00$\frac{1}{2}$ of \$25? \$1.25 is what decimal of \$5.00?

49. What is .0$\frac{2}{3}$ of 30? What is .5 of .16$\frac{2}{3}$ of 75?

50. The difference between 2 cents and 3 cents is what decimal of 2 cents?

51. If A's money is .5 of B's, B's is how many times A's?

52. If my money is .25 of yours, yours is how many times mine?

53. A's farm is .66$\frac{2}{3}$ times as large as B's; then B's is how many times as large as A's?

54. John is .75 as heavy as his father. His father is how many times as heavy as he?

55. My age is .4 of my mother's. Her age is how many times mine?

56. Divide 1 by $\frac{2}{3}$. Divide 1 by $\frac{5}{9}$. Divide 1 by $\frac{7}{8}$. Divide 1 by $\frac{7}{9}$.

57. 1 ÷ $\frac{3}{4}$ = ? 1 ÷ $\frac{10}{11}$ = ? 1 ÷ $\frac{5}{6}$ = ? 1 ÷ .25 = ? 1 ÷ .5 = ? 1 ÷ .75 = ?

58. Here is a new word: *re-cip'-ro-cal.* The reciprocal of any number is the quotient obtained by dividing 1 by that number.

59. Find the reciprocal of each of the following:

2, 10, 17, 20, 25, 100, 75, 85, 88, 37, 45, 18, 24; $\frac{1}{2}$, $\frac{1}{3}$, $\frac{2}{3}$, $\frac{1}{4}$, $\frac{3}{4}$, $\frac{5}{6}$, $\frac{7}{8}$, $\frac{5}{11}$, $\frac{7}{10}$, $\frac{3}{5}$, $\frac{15}{16}$, $\frac{20}{27}$, $\frac{49}{50}$, $\frac{40}{48}$, $\frac{5}{3}$, $\frac{5}{7}$; $1\frac{1}{2}$, $1\frac{1}{3}$, $1\frac{2}{3}$, $1\frac{1}{4}$, $1\frac{3}{4}$, $1\frac{1}{6}$, $1\frac{5}{6}$, $2\frac{1}{2}$, $2\frac{2}{3}$, $3\frac{3}{4}$, $3\frac{4}{5}$, $3\frac{3}{5}$, $1\frac{1}{10}$.

195

1. If a yard of ribbon costs $12\frac{1}{2}$ cents, how many yards can be bought for $5?

2. At $16\frac{2}{3}$ cents per yard, how many yards of muslin will cost $4?

3. At $8\frac{1}{3}$ cents a pound, what will 24 pounds of cheese cost?

4. If a man's wages are $33\frac{1}{3}$ a week, how long must he work to earn $300?

5. At $1.25 a gallon, what will 10 gallons of ice cream cost?

6. At $.80 a pound, how many pounds of tea will cost $20?

7. If 8 yards of lace cost $1.00, what will 10 yards cost?

8. If 2 yards of gingham cost $66\frac{2}{3}$ cents, how many yards can be bought for $12?

9. If 17 half-pints of cream cost $.85, what will 13 pints cost?

10. If 5 collars cost $.75, what will 12 collars cost?

11. If 12 felt hats cost $30, what will 15 hats cost?

12. If 12 hats cost $30, how many can be bought for $40?

13. If 15 yd. of broadcloth cost $75, how many yards can be bought for $125?

14. If $7\frac{1}{2}$ cords of wood cost $37.50, what will 14 cords cost?

15. If $9\frac{1}{2}$ bushels of potatoes cost $5, how many bushels will $1 buy?

16. If 15 men do a piece of work in 12 da., how long will it take 4 men to do it?

17. If 10 men do a piece of work in 6 days, how many men will it take to do it in 15 days?

18. If a post 5 ft. high casts a shadow $7\frac{1}{2}$ ft. long, how long a shadow will a post 11 ft. high cast?

19. If a post 3 ft. high casts a shadow 5 ft. long, how high is a church steeple whose shadow is 125 ft. long?

20. If 25 gallons of water last a certain number of men 7 days, how long will 35 gallons last?

21. If 5 bbl. of flour last 3 men a certain time, how many barrels will be required for 100 men for the same time?

22. How many feet of wire can you buy for \$16 if you can get 2 yards for $\$.16\frac{2}{3}$?

23. At the rate of 4 for 5 cents, how many lemons can you buy for $31\frac{1}{4}$ cents?

24. At the rate of 3 for 10 cents, how many newspapers can a boy buy for \$1.00?

25. If $\frac{1}{2}$ the value of a ship is \$3600, what is $\frac{7}{8}$ of its value?

26. If \$81 is $\frac{9}{10}$ of the cost of a certain cow, what is $\frac{11}{9}$ of the cost?

27. I sold an acre of land for \$75, which was $\frac{3}{4}$ of the cost. If I had sold it for \$125, the selling price would have been what part of the cost?

28. A dozen chairs cost \$25. What would 9 chairs cost at the same rate?

29. If $\frac{7}{8}$ of a yard of velvet cost \$3.50, what will $1\frac{1}{2}$ yards cost?

30. If lumber costs \$35 per M., how many feet cost \$28?

31. After I had spent .33$\frac{1}{3}$ of my money and then .16$\frac{2}{3}$ of it and then .25 of it, I had \$7 left. How much had I at first?

32. $\frac{1}{2}$ of my money is $\frac{2}{3}$ of Paul's. $\frac{1}{2}$ of his money is \$15. How much has each?

33. At the rate of 15 pounds for \$1$\frac{1}{2}$, how many pounds of raisins can be had in exchange for 5 dozen eggs at 22 cents?

34. A farmer's barley crop was 120 bushels. If he puts it into sacks holding 2$\frac{1}{2}$ bushels, what will the sacks cost at 10 cents apiece?

35. If it takes 12 sheets of tin 24 in. wide to line a tank, how many sheets 30 in. wide will be needed to line another of same size?

36. How many men will dig 24 feet of ditch in the same time it takes 3 men to dig 18 feet? In half the time?

37. How many men will dig 45 feet of ditch in the same time it takes 5 men to dig 25 feet? In one-third the time?

38. If 8 men dig 32 feet of ditch in a given time, how many feet will 11 men dig in the same time?

39. One-half of the distance around a certain square field is 24 rods. What is its area?

40. What is the field worth at \$100 per acre?

41. Divide \$75 between two boys, giving one boy 50 cents when you give the other 25 cents. How much will each receive?

42. Divide 75 into two parts having the ratio of 2 to 1. [*Ratio*, relation.]

43. A publisher receives orders for 900, 1500, and 2100 copies of a book respectively. He has only 3000 copies in

stock. If his 3 customers share in proportion to their orders, how many books will each receive?

44. A man divides \$111 among his three sons according to their ages, which are 10, 12, and 15 years respectively. How many dollars does each receive?

45. Three men together own an oil well. The profits are \$150 per day. How much should each receive if they put into it respectively the sums of \$500, \$3500, and \$1000?

196

1. How many feet in 7 yd.? $7\frac{1}{2}$ yd.? $10\frac{1}{4}$ yd.? $8.33\frac{1}{3}$ yd.? $1.66\frac{2}{3}$ yd.?

2. How many inches in $5\frac{1}{2}$ ft.? $6\frac{1}{3}$ ft.? $8\frac{1}{4}$ ft.? $83\frac{1}{3}$ ft.? $2.08\frac{1}{3}$ ft.?

3. $1\frac{1}{2}$ yd. are how many feet? Inches? 7.75 yd. are how many inches?

4. 15 in. are how many feet? What part of a yard? What decimal of a yard? Of 2 yd.?

5. 9 in. are what part of a yard? What decimal of 1 yd.? Of 3 yd.?

6. $\frac{1}{2}$ yd. are how many inches? Feet? What part of 5 ft.? What decimal of 30 in.?

7. .5 of a yard is how many feet? Inches? .75 of a yard is how many feet?

8. 1.5 yd. are how many feet? Inches? 1.25 yd. are what part of 5 yd.?

9. $.33\frac{1}{3}$ yd. are how many inches? Feet? $.66\frac{2}{3}$ yd. are how many inches?

10. $.16\frac{2}{3}$ yd. are how many inches? 100 in. are how many yards?

11. 24 in. are what part of a yard? Of 2 yd.? Of 3 yd.?

12. 2 rods are how many yards? Feet? 10 rods are how many feet? Yards?

13. Change $.09\frac{1}{11}$ rd. to yards. To feet. To inches.

14. 160 rods are what part of a mile? What decimal?

15. What part of a mile are 10 rods? 20 rods? 32 rods? 100 rods?

16. .25 of a mile is how many rods? .125 mi.?

17. A boy runs 10 rd. a minute. How long will it take him to run a mile?

18. A kite tail is 10 yd. 2 ft. long. How many yards long is it? How many feet long? Is it more or less than 2 rd. long?

19. A certain wheel goes 4 ft. 10 in. in each revolution. What is the length in yards around it?

20. What will $1\frac{5}{8}$ miles of fence at $\$1\frac{1}{2}$ per rod cost? $1.62\frac{1}{2}$ miles?

21. The distance around a certain building is 100 rods. How many paces of 3 feet will a man take in going around it?

22. 1 mile and 50 rods are how many rods? 1.9 mi. are how many rods?

23. .75 of a mile is how many rods? $.37\frac{1}{2}$ mi.? .625 mi.?

24. $.87\frac{1}{2}$ of a mile are how many rods?

25. 120 rods are what part of a mile? What decimal?

26. How many miles around a field that is 300 rods long and 200 rods wide?

27. The distance around a certain square field is 800 rods. What part of a mile is one side?

28. 10 rods are how many yards? How many feet?

29. $\frac{1}{2}$ rd. is how many yards? How many feet?

30. How many feet of picture molding will be needed to fit a room 17 ft. wide and 20 ft. long?

31. $\frac{1}{6}$ of a mile is what decimal of a mile?

32. .375 of a mile is what fraction of a mile?

33. $\frac{5}{8}$ of a mile is what decimal of a mile?

34. 5 yards are what part of a mile?

35. A certain street is 66 ft. wide. What part of a mile is this?

36. At a certain time a monument 25 feet high cast a shadow 5 yards long. What part of the height of the monument is the length of its shadow?

37. At the same time a certain church steeple casts a shadow 30 feet long. How high is the steeple?

38. How many rods of iron rails are used in laying 10 miles of railroad track?

39. How many feet of rabbit wire are used in inclosing a lot 50 feet wide and 150 feet deep? How many yards?

40. 5 yd. $\div \frac{3}{4}$ yd. = what? $7\frac{1}{2} \div \frac{3}{4} = ?$ $7.5 \div .75 = ?$

41. 7 yd. $\div \frac{3}{4}$ yd. = what? $10\frac{1}{2} \div \frac{3}{4} = ?$ $10.5 \div .75 = ?$

42. 10 yd. $\div \frac{3}{4}$ yd. = what? $17 \div \frac{3}{4} = ?$ $17. \div .75 = ?$

43. $4\frac{1}{2}$ yd. $\div \frac{3}{4}$ yd. = what? $3\frac{2}{3} \div \frac{3}{4} = ?$ $4.5 \div .75 = ?$

44. $5\frac{1}{8}$ yd. $\div \frac{3}{4}$ yd. = what? $15 \div \frac{3}{4} = ?$ $15. \div .75 = ?$

45. How many strips of carpet $\frac{3}{4}$ of a yard wide will be required to cover the floor of a room 12 ft. wide if the strips are laid lengthwise?

46. How many if the room is 27 ft. wide?

47. What are 11 strips of carpet, each containing 5 yards, worth at $1 per yard?

48. What is the cost of 3 strips of carpet, each strip being 21 feet long, at $1.50 per yard?

49. How long is a stone wall inclosing a field 16 rods wide and 20 rods long? What decimal part of a mile long?

50. How many yards in a mile? In two miles?

51. How many feet in a mile? In three miles?

52. How many rods in a mile? How many chains in a mile? (4 rd. = 1 chain.)

53. How many rods in a chain? How many feet in a rod? Then, how many feet in a chain?

54. How many links in a rod? How many links in a chain?

55. 1 chain is how many links? Rods? Feet? Yards?

56. A chain can be laid twice across a certain lot. How wide is the lot?

57. How many steps of 24 inches will you take in marching the length of a chain?

58. What decimal of a mile are 50 ch.? 60 ch.? 70 ch.? 30 ch.?

59. 60 chains is $\frac{3}{5}$ of the distance around a certain field. What is the distance around it?

60. What part of a chain are 72 links? 85 links?

61. How many chains in 1760 yards?

62. How many chains in 5280 feet?

63. How many links in 10 chains?

64. How many feet in 10 chains?

65. 6.5 ch. are how many links?

66. 8.75 ch. are how many links?

67. 5.25 ch. are how many links?

68. 125 l. are how many chains?

69. 1000 l. are how many chains?

70. 66 ft. are how many links?

71. 27 inches are .75 of how many inches?

72. 30 inches are $.66\frac{2}{3}$ of how many inches?

73. $5\frac{1}{2}$ yards are $.33\frac{1}{3}$ of how many yards?

74. 85 links are what part of 100 links?

75. 100 rods are $.83\frac{1}{3}$ of how many rods?

76. 150 rods are what part of a mile?

77. 60 feet are what decimal of a chain?

78. $3\frac{1}{2}$ yards are what part of a rod?

79. 20 links are what decimal of a rod?

80. $1\frac{1}{2}$ rods are what part of a chain?

81. How far around a field twice as long as wide if it is 20 rods wide?

82. How far around a field .5 as wide as long if it is 10 rods wide?

83. My garden is 50 feet long and .8 as wide. How much fence will be required to inclose it on the two sides and one end?

84. Frances is 4 feet 8 inches tall, and her father is $1.12\frac{1}{2}$ times as tall. How tall is he?

85. I measured a stake and its shadow, finding the shadow to be $.83\frac{1}{3}$ as long as the stake was tall. How high is a building whose shadow at the same time was 60 feet long?

197

1. My table is 3 feet wide and 4 feet long. How many square feet in it?

2. How many square feet in a table $2\frac{1}{2}$ feet wide and 4 feet long? 1.75 ft. by 4 ft.?

3. What is the surface of a table 4 ft. wide and 6.25 ft. long?

4. What is the surface of the floor of a room 10 ft. wide and 15 ft. long?

5. What is the surface of a floor 12 ft. by 20 ft.? 12 ft. by $20.33\frac{1}{3}$ ft.?

6. How many square feet in the ceiling of each room above mentioned?

7. What is the ceiling of a room $14\frac{1}{2}$ ft. by 16 ft.?

8. What is the surface of one wall of a room 10 ft. high, if the wall is 14 ft. long?

9. Of opposite walls in the above-mentioned room?

10. A certain room is 12 ft. square. If the walls were straightened out into one wall, how long would it be? In other words, how far is it around a room 10 ft. square? 12 ft. square? 20.5 ft. square?

11. How far is it around a room $12.33\frac{1}{3}$ feet wide and 15 feet long? If the walls in this room are 10 feet high, how many square feet in them?

12. What is the surface of the walls of a room 10 ft. wide and 12 ft. long, if the room is 10 ft. high?

13. A certain room is 15 ft. square. It is 11 ft. high. What is the area of its walls? Of its ceiling?

14. A certain square room has 81 square feet in its ceiling. What is the size of the room?

15. The area of a certain table is 40 sq. ft. It is 4 ft. wide. How long is it?

16. If the area of a billboard is 240 sq. ft. and it is 20 ft. long, how wide is it?

17. The area of a given rectangle is 200 sq. ft. It is twice as long as wide. Draw a diagram of it and find its dimensions. [*Rectangle*, a figure having four sides and four square corners.]

18. Another rectangle contains 8 sq. ft. It is half as wide as long. Draw a diagram and find dimensions.

19. How many square inches in a square foot? In 2 sq. ft.? In $1\frac{1}{2}$ sq. ft.?

20. $\frac{1}{2}$ sq. ft. is how many square inches? .25 sq. ft. is how many square inches?

21. 10 sq. ft. are how many square inches? 10.75 sq. ft. are how many square inches?

22. 84 sq. in. are what part of a square foot? 72 sq. in. are what decimal of a square foot?

23. 10 sq. yd. are how many square feet?

24. 7 sq. ft. are what part of a square yard?

25. 5 sq. ft. are what decimal of 1 sq. yd.?

26. $.44\frac{4}{9}$ sq. yd. is how many square feet?

27. Change $.62\frac{1}{2}$ sq. yd. to the fraction of a square yard.

28. How many square yards in 1 sq. rd.? In 2?

29. 90.75 sq. yd. are how many square rods?

30. $\frac{1}{3}$ sq. rd. is how many square yards?

31. One acre is equal to how many square rods?

32. A man owned 10 acres of land and sold $\frac{1}{2}$ of it. How many square rods did he sell?

33. A lot 10 rods by 12 rods contains what part of an acre?

34. .87$\frac{1}{2}$ of an acre is how many square rods?

35. How far must you walk to walk along one side of a section of land?

36. How far to walk around it if it be square?

37. How many acres in a section, or square mile?

38. Draw a map of a section of land and divide it into quarters. What will the east $\frac{1}{2}$ of the northeast $\frac{1}{4}$ sell for at $100 per acre?

39. How many square feet in a gable roof whose ridge-pole is 20 ft. and whose rafters are 15 ft.?

40. What is the area of the bottom of a box 3 ft. wide and 5 ft. long? What is the area of the cover?

41. What is the area of one of the sides of a box 2 ft. deep and 5 ft. long? What is the area of the opposite side?

42. What is the area of the end of a box 2 ft. deep and 3 ft. wide? What is the area of the opposite side?

43. What is the outside surface of a box 2 ft. deep, 3 ft. wide, and 5 ft. long?

44. What is the outside surface of a box 1 ft. deep, 3 ft. wide, and 4 ft. long?

45. Draw a box, mark dimensions, and find area.

46. How many sides has every cube or other rectangular solid?

47. Find the area of a block of stone 4 ft. thick, 5 ft. wide, and 10 ft. long.

48. The inside measurements of a covered rectangular tank are 3 ft., 4 ft., and 6 ft. How many square feet of zinc will be required to line it?

49. The area of one of the sides of a cubical box is 25 sq. ft. What are the dimensions?

50. The area of a certain cubical block of stone is 294 sq. ft. What are the dimensions?

51. One square mile is how many acres?

52. What is another name for a square mile?

53. $\frac{1}{2}$ sq. mi. is how many acres?

54. If an acre be divided into 10 equal parts, one part is a square chain. How many acres in a square chain?

55. How many square chains in 1 A.? In $1\frac{1}{2}$ A.?

56. In a quarter-section how many square chains?

57. A man owned a quarter-section of land. He sold 5 square chains. How many acres had he left?

58. What are 2 sq. ch. of land worth at \$100 per acre?

59. Draw a diagram of a field 4 rd. square. What is its area? Draw another diagram of a field each of whose sides is 1 ch. What is its area? What is the relative size of these two fields?

60. 1 sq. ch. is how many square rods?

61. 1 A. is how many square chains?
1 sq. ch. is how many square rods?
Then 1 A. is how many square rods?

62. How many square rods in an acre?

63. What is an acre of land worth at $100 per square rod?

64. 25 times 25 is what?

65. 1 rod is how many links?
Then 1 sq. rd. is how many square links?

66. 125 sq. l. are what decimal of 1 sq. rd.?

67. How many square links in 1 sq. rd.?

68. 10 sq. rd. 500 sq. l. are how many square links?

69. Draw a diagram to illustrate: A surveyor laid his chain 5 times to the north of a given point, then 4 times to the east, then 6 times to the south, then 4 times to the west, then to point of starting. How many times did he lay the chain in all?

70. A man owned $\frac{1}{2}$ of a quarter-section of land. He sold 1 sq. ch. What part of his land did he sell?

71. At $\$1\frac{1}{2}$ per acre, what does a quarter-section of land cost?

198

1. A certain block of stone is 2 ft. wide and 3 ft. long. What is the area of one of its sides? It is one foot thick, therefore its solid contents is 6 cu. ft. Another stone of equal size is placed upon it. Now, there are how many cubic feet in the two stones?

A third stone is equal in size to these two. Its length and breadth are the same as the length and breadth of each of the others, 2 ft. by 3 ft. Its thickness is the same as both the others, 2 ft. Therefore its solid contents is as much as the sum of the other two. How much is that? Hence, a block of stone 2 ft. by 2 ft. by 3 ft. contains $2 \times 2 \times 3$ cu. ft., or 12 cu. ft.

2. How many cubic feet in a block 5 ft. long, 3 ft. wide, and 2 ft. thick?

3. Find the contents of a rectangular solid $1\frac{1}{2}$ ft. thick, 4 ft. wide, and 10 ft. long.

4. In a block of wood 6 ft. long, 3 ft. wide, and $3\frac{1}{2}$ ft. thick, are how many cubic feet?

5. A certain solid is 1 ft. wide, $3\frac{1}{2}$ ft. long, and 2 ft. thick. What is its contents?

6. What is the contents of a brick 8 in. long, and 5 in. wide, and $2\frac{1}{2}$ in. thick?

7. How many cubic feet in a solid 15 in. by 1 ft. by 5 ft.?

8. In a pile of wood 8 ft. long, 4 ft. wide, and 4 ft. high, how many cubic feet? This is one cord.

9. How many cubic feet in one cord?

10. 2 cords are how many cubic feet?

11. $1\frac{1}{2}$ cords are how many cubic feet? 1.25 cords are how many cubic feet?

12. $\frac{3}{4}$ cord is how many cubic feet? .625 cord is how many cubic feet?

13. A pile of wood 4 ft. long, 2 ft. wide, and 4 ft. high, contains what part of a cord? What decimal of 1 cd.?

14. 1280 cu. ft. are how many cords?

15. How many cords of wood will just fill a wagon-box 8 ft. long, 4 ft. wide, and 6 ft. deep?

16. How many cubic feet of water will a tank 8 ft. by 4 ft. by 6 ft. hold?

17. How many cubic feet of air in a room 10 ft. high, 10 ft. wide, and 12 ft. long?

18. How many cubic feet of masonry in a wall 3 ft. high, 3 ft. wide, and 30 ft. long?

19. 3 ft. = 1 yd. $(3 \times 3 = 9)$ 9 sq. ft. = 1 sq. yd. $(3 \times 3 \times 3 = 27)$ 27 cu. ft. = 1 cu. yd.

270 cu. ft. are how many cubic yards?

20. How many cubic yards in 81 cu. ft.?

21. 5 cu. yd. are how many cubic feet?

22. What part of 108 cu. ft. is 1 cu. yd.? What decimal?

23. 12 in. = 1 ft. $(12 \times 12 = 144)$ 144 sq. in. = 1 sq. ft. $(12 \times 12 \times 12 = 1728)$ 1728 cu. in. = 1 cu. ft.

24. 1 cu. ft. is how many cubic inches?

25. 864 cu. in. are what decimal of a cubic foot?

26. How many cubic feet of earth were excavated in digging a ditch $1\frac{1}{2}$ ft. wide, $1\frac{1}{2}$ ft. deep, and 50 ft. long?

27. $.12\frac{1}{2}$ of a cubic foot is how many cubic inches? $.11\frac{1}{9}$ cu. ft. is how many cubic inches?

28. The contents of a certain stone is 320 cu. ft. It is 4 ft. thick and 8 ft. wide. How long is it?

29. Change .375 of a cord to cubic feet.

30. If a cubic foot of wood weigh 20 lbs., how much will weigh 540 lbs.?

31. Some units of measurement compared:

Unit of length, 1 foot.

Unit of area, 1 foot by 1 foot, or 1 square foot.

Unit of contents, 1 foot by 1 foot by 1 foot, or 1 cubic foot.

Unit of lumber measure, 1 foot by 1 foot by 1 *inch*, or 1 board foot.

How many board feet in a cubic foot?

32. How many board feet in a board 1 in. thick, 1 ft. wide, and 12 ft. long?

33. How many board feet in 2 such boards?

34. How many board feet in a plank 2 in. thick, 1 ft. wide, and 12 ft. long? In 2?

35. How many board feet in 100 one-inch boards 10 inches wide and 18 feet long?

36. How many board feet in a joist 4 in. wide, 4 in. thick, and 12 ft. long?

37. How many feet in a timber 4 in. square and 18 ft. long?

38. How many M. are 2375 ft.? 500 ft.? 10,325 ft.? 9250 ft.? 4250 ft.? 9500 ft.? $3333\frac{1}{3}$ ft.?

39. Find cost at \$20 per M.: 5000 ft., 10,250 ft., 9500 ft.

40. Find cost at \$24 per M.: $3333\frac{1}{3}$ ft., 5375 ft., 2625 ft.

41. Find cost at \$30 per M.: 20,000 ft., 100,000 ft., 750 ft.

42. Find average width of tapering boards whose ends are respectively:

8 inches and 12 inches.	8 inches and 9 inches.
9 inches and 15 inches.	4 inches and 5 inches.
3 inches and 4 inches.	7 inches and 11 inches.
10 inches and 12 inches.	4 inches and 7 inches.
7 inches and 9 inches.	9 inches and 11 inches.

199

1. 1 gallon and three quarts are how many quarts?

2. 1 gal. 3 qt. 1 pt. are how many pints?

3. Same are how many quarts?

4. Same are how many gallons?

5. How many quarts in a barrel?

6. 2 bbl. are how many quarts?

7. A milkman has a 5-gallon can full of milk which he leaves to customers who take 1 quart each. How many customers will it supply and how much is it worth at 7 cents a quart?

8. How many pint bottles will be required to hold $12\frac{1}{2}$ gallons of oil?

9. In $\frac{1}{2}$ bbl. how many quarts?

10. From a cask containing 28 gallons, 5 quarts leaked out. What part of the contents of the cask was lost?

11. What was the leakage worth at 80 cents per gallon?

12. What is the contents in cubic inches of a gallon? (231 cu. in.) Of 2 gal.? Of 10? Of 100?

13. How many cubic inches in a quart?

14. How many half-pint bottles can be filled from a gallon and a half?

15. Which is more and how much; $\frac{1}{16}$ gallon or $\frac{1}{2}$ pint?

16. Change 3 qt. 1 pt. to the decimal of a gallon.

17. .375 gal. is how many pints?

200

1. How many ounces in 1 pound? In 2?

2. 240 oz. are how many pounds?

3. 2 oz. are what part of a pound?

4. .$87\frac{1}{2}$ lb. is how many ounces? .$62\frac{1}{2}$ lb.?

5. 40 pounds is .8 of all I can lift. How many pounds can I lift?

6. 150 pounds is $1\frac{1}{2}$ times what my brother can lift. How much can he lift?

7. 48 lbs. is $\frac{3}{4}$ of my weight. How much do I weigh?

8. 80 lbs. 15 oz. (average weight of 3 persons).
$\underline{\quad 3 \quad}$
(whole weight of 3 persons).

9. 5)320 lbs. 10 oz. (whole weight of 5 children).
(average weight).

10. A certain four-horse team weighs 4448 lbs. 12 oz. What is the average weight of the horses?

11. Change 5276 lbs. to tons.

12. Change 6495 lbs. to tons.

13. .25 T. is how many pounds?

14. How many centals in $3\frac{1}{2}$ tons? How many pounds?

15. What are $2\frac{1}{2}$ centals of dried fish worth at 5 cents a pound?

16. $16\frac{2}{3}$ lbs. are what fraction of a cental?

17. What is the cost of $\frac{3}{4}$ of a cental of flour at $1\frac{1}{3}$ cents per pound?

18. How many pounds of butter at 35 cents a pound are worth as much as $5\frac{1}{2}$ gal. milk at 10 cents a quart?

19. In 1 ton how many ounces?

20. What decimal of a ton are 750 pounds?

21. 250 tons are $.83\frac{1}{3}$ of how many tons?

22. How many ounces in a pound Troy?

23. How many pennyweights in 1 oz.? In 2?

24. $\frac{4}{5}$ of an ounce is $\frac{1}{2}$ of how many pennyweights?

25. 2 lbs. 4 oz. are how many ounces? Pounds?

26. 10 oz. 18 pwt. are how many pennyweights? Ounces?

27. 32 pwt. are .66⅔ of how many pennyweights?

28. 1 lb. 6 oz. 6 pwt. are how many pennyweights? Ounces? Pounds?

29. 1 pwt. is how many grains? 3 pwt.? 5?

30. 18 grains are what part of a pennyweight?

31. What decimal of a pennyweight are 9 grains?

32. Express 10 pwt. 15 gr. as grains.

33. Express same as pennyweights.

34. If a pennyweight of gold is worth a dollar, how many grains are worth 25 cents?

PERCENTAGE

201

Does $\frac{1}{2}=\frac{5}{10}=.5$? Do we change the value of .5 if we annex a cipher, writing it .50? Are .50 and $\frac{50}{100}$ equal in value? Here is another way of writing $\frac{50}{100}$: 50%. Notice how the 100 in the denominator is used in the sign %. 50% is read, 50 *per cent.*

Note that $\frac{1}{2}=\frac{5}{10}=.5=.50=\frac{50}{100}=50\%$.

Now you must learn the same about many fractions, and must finally shorten all, as $\frac{1}{2}=50\%$, since the sign % is equal to the denominator 100,

1. $25\%=\frac{25}{100}$, reduced to lowest terms, equals $\frac{1}{4}$.

$20\%=\frac{\quad}{100}$ " " " " " ?

$10\%=\frac{\quad}{100}$ " " " " " ?

$75\%=\frac{\quad}{100}$ " " " " " ?

2. $60\% = \frac{60}{100} = \frac{3}{5}$.

70% 80% 90% 40% 30% 65% 95% 85% 55% 45%
35% 5% 4% 8% 3% 2% 1% 6% 7% 9%

3. Change these to fractions in lowest terms:

15% 16% 24% 28% 36% 44% 88% 66% 99% 77%
33% 56% 84% 76% 48% 96% 94% 86% 22% 34%

4. $12\frac{1}{2}\% = ?$ $37\frac{1}{2}\% = ?$ $62\frac{1}{2}\% = ?$ $87\frac{1}{2}\% = ?$

5. What is 25% of 40? 60? 24? 36? 1000? 8? 1? 1200? 2000? 50?

6. What is 50% of 30? 100? 1000? 12? 25? 8? 7? 44? 4000? 1500? 80?

7. What is 75% of 36? 20? 100? 1000? 10? 50? 80? 24? 2? 16? 48? 96?

8. Find $12\frac{1}{2}\%$, $37\frac{1}{2}\%$, $62\frac{1}{2}\%$, and $87\frac{1}{2}\%$ of each of the following numbers:

40, 64, 24, 96, 80, 72, 88, 8, 16, 32, 56, 800, 160, 7200, 240, 2400, 4000, 880, 8000, 1600, 720, 120, 1200, 440, 816, 152, 728, 960.

9. $33\frac{1}{3}\% = ?$ $66\frac{2}{3}\% = ?$

10. Take $33\frac{1}{3}\%$ and $66\frac{2}{3}\%$ of each of these numbers:

30, 60, 90, 120, 150, 180, 18, 15, 21, 210, 24, 27, 36, 33, 480, 3000, 6000, 51, 81, 6, 900, 72, 240, 1200, 150, 1500, 96, 9600, 100.

11. Change these to common fractions in lowest terms:

20% 40% 60% 80% 30% 50% 70% 90% 1% 2%
3% 4% 5% 6% 7% 8% 9% 10% 11% 12%

12. What is:

70% of 40?	25% of 48?	$33\frac{1}{3}$% of 60?	$66\frac{2}{3}$% of 24?
$12\frac{1}{2}$% of 24?	$87\frac{1}{2}$% of 40?	$37\frac{1}{2}$% of 72?	4% of 500?
1% of 700?	5% of 200?	$62\frac{1}{2}$% of 480?	$33\frac{1}{3}$% of 240?
$66\frac{2}{3}$% of 240?	4% of 200?	$37\frac{1}{2}$% of 64?	

13. Memorize all that have been given and these, which you may also prove:

$16\frac{2}{3}\% = \frac{1}{6}$ $14\frac{2}{7}\% = \frac{1}{7}$ $11\frac{1}{9}\% = \frac{1}{9}$ $9\frac{1}{11}\% = \frac{1}{11}$ $8\frac{1}{3}\% = \frac{1}{12}$
$6\frac{2}{3}\% = \frac{1}{15}$ $6\frac{1}{4}\% = \frac{1}{16}$

14. Comparing the following with the above, state what each is when written as a common fraction:

$22\frac{2}{9}\%$ $44\frac{4}{9}\%$ $55\frac{5}{9}\%$ $77\frac{7}{9}\%$ $88\frac{8}{9}\%$ $18\frac{2}{11}\%$ $45\frac{5}{11}\%$
$27\frac{3}{11}\%$ $36\frac{4}{11}\%$ $83\frac{1}{3}\%$ $28\frac{4}{7}\%$ $13\frac{1}{3}\%$ $18\frac{3}{4}\%$

15. Find $14\frac{2}{7}$% of 21, 35, 42, 84, 70, 700, 100, 50, 14, 140, 35, 3500.

16.	**17.**	**18.**	**19.**	**20.**
$16\frac{2}{3}$% of:	$83\frac{1}{3}$% of:	$14\frac{2}{7}$% of:	$11\frac{1}{9}$% of:	$9\frac{1}{11}$% of:
6	30	28	36	44
36	60	21	90	66
60	54	35	54	121
66	72	14	72	33
96	180	42	18	55
12	18	49	81	88
42	600	70	180	77
120	420	77	1800	1100
240	1200	84	27	220
300	10	140	270	10

21.	22.	23.	24.	25.
$8\frac{1}{3}\%$ of:	$6\frac{2}{3}\%$ of:	$6\frac{1}{4}\%$ of:	1% of:	1% of:
1200	15	3200	500	2000
600	30	320	700	5500
36	60	32	240	1728
60	75	16	375	6600
6000	150	80	498	3000
72	3000	800	673	5760
96	600	96	537	5250
144	90	24	284	4782
576	120	64	715	6840
240	1200	48	800	2350

26.	27.	28.	29.	30.
1% of:	1% of:	$\frac{1}{2}\%$ of:	$\frac{1}{3}\%$ of:	1% of:
$25	$5.00	$300	$300	$1.00
75	10.00	400	600	2.00
32	7.00	800	1200	10.00
14	7.50	1000	120	5.00
20	2.50	1200	12	4.00
35	4.50	1500	60	100.00
63	$4\frac{1}{2}$	1728	84	400.00
87	$3\frac{1}{2}$	5840	51	200.00
45	9.75	3250	990	20.00
16	3.375	72	180	2000.00

31. $\frac{1}{5}\%$ of \$150, $\frac{1}{6}\%$ of \$60, $\frac{1}{10}\%$ of \$75, $\frac{1}{10}\%$ of \$7.50, $\frac{1}{8}\%$ of \$5.60.

32. $\frac{1}{2}\%$ of \$2.50, $\frac{1}{3}\%$ of .60, $\frac{1}{7}\%$ of \$1400, $\frac{1}{9}\%$ of \$810, $\frac{1}{4}\%$ of \$1200.

202

1. What is $\frac{1}{2}$ of \$200? What is $\frac{1}{2}\%$ of \$200?

2. What is $\frac{1}{3}$ of \$3.60? What is $\frac{1}{3}\%$ of \$3.60?

3.	What is $\frac{1}{10}$ of 1000?	What is $\frac{1}{10}\%$ of 1000?
4.	What is $\frac{1}{4}$ of 24?	What is $\frac{1}{4}\%$ of 24?
5.	What is $\frac{2}{3}$ of 300?	What is $\frac{2}{3}\%$ of 300?
6.	What is $\frac{3}{4}$ of 120?	What is $\frac{3}{4}\%$ of 120?
7.	What is $\frac{5}{8}$ of 4000?	What is $\frac{5}{8}\%$ of 4000?
8.	What is $\frac{7}{8}$ of 560?	What is $\frac{7}{8}\%$ of 560?
9.	What is $\frac{4}{11}$ of 44?	What is $\frac{4}{11}\%$ of 44?
10.	What is $\frac{2}{5}$ of 250?	What is $\frac{2}{5}\%$ of 250?

It is important to note how much the sign % affects the value of any number. It should always be used with care, as should the decimal point.

11.	What is $\frac{1}{2}\%$ of 40?	What is .5% of 40?
12.	What is $\frac{1}{4}\%$ of 600?	What is .25% of 600?
13.	What is $\frac{3}{4}\%$ of 1000?	What is .75% of 1000?
14.	What is $\frac{1}{10}\%$ of 50?	What is .1% of 50?
15.	What is $\frac{3}{5}\%$ of 25?	What is .6% of 25?
16.	What is .7% of \$1400?	\$700? \$70? \$7? \$1000?
17.	What is .15% of \$600?	What is 15% of \$600?
18.	What is $1\frac{1}{2}\%$ of 1000?	What is 1.5% of 1000?
19.	What is $1\frac{2}{3}\%$ of 360?	What is $1\frac{2}{3}\%$ of 36?
20.	What is 2.5% of 100?	What is 25% of 100?
21.	What is $2\frac{1}{2}\%$ of 68?	What is $2\frac{1}{2}\%$ of 680?
22.	What is $1\frac{1}{4}\%$ of 200?	What is 1.25% of 200?
23.	What is 100% of 200?	What is 125% of 200?
24.	What is 125% of 20?	What is 125% of 2?
25.	What is 150% of 1000?	What is 150% of 10?

203

1. Often it is necessary to change a common fraction to a decimal or a per cent. Some fractions should be memorized in per cents. This should be done as thoroughly as one learns the multiplication table.

Change these to % from memory of previous lessons:

$\frac{1}{2}$, $\frac{1}{3}$, $\frac{2}{3}$, $\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{5}$, $\frac{2}{5}$, $\frac{3}{5}$, $\frac{4}{5}$, $\frac{1}{6}$, $\frac{5}{6}$, $\frac{1}{7}$, $\frac{1}{8}$, $\frac{1}{9}$, $\frac{1}{10}$, $\frac{3}{10}$, $\frac{7}{10}$, $\frac{9}{10}$, $\frac{1}{11}$, $\frac{1}{12}$, $\frac{1}{20}$, $\frac{1}{25}$, $\frac{1}{50}$, $\frac{1}{1000}$.

2. One will need to change to % other fractions than those he has memorized, so he must learn how it is done. Let us take $\frac{1}{2}$ to change to %.

As *per cent* means *hundredths*, changing $\frac{1}{2}$ to % means changing it to hundredths.

$$\frac{1}{2\times 50}=\frac{\quad}{100}, \text{ therefore } \frac{1\times 50}{2\times 50}=\frac{50}{100}=50\%.$$

3. What must each of the following denominators be multiplied by to make them 100?

$\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{50}$, $\frac{1}{25}$, $\frac{1}{20}$?

4. Remember, if you would not change the value of a fraction, you must perform the same operation upon the numerator that you do upon the denominator.

5. Change these fractions to %: (They involve a multiplier that is a mixed number.)

$\frac{1}{75\times ?}=\frac{\quad}{100}=?$ $\frac{1}{16}$, $\frac{5}{24}$, $\frac{3}{75}$, $\frac{1}{30}$, $\frac{9}{40}$, $\frac{7}{80}$, $\frac{9}{16}$, $\frac{1}{15}$, $\frac{8}{15}$, $\frac{11}{60}$, $\frac{5}{70}$, $\frac{1}{70}$, $\frac{7}{90}$, $\frac{1}{14}$, $\frac{1}{45}$.

6. What kind of a multiplier do these involve? Change them:

$\frac{1}{200\times ?}$, $\frac{1}{500}$, $\frac{1}{600}$, $\frac{1}{1000}$, $\frac{3}{400}$, $\frac{3}{800}$, $\frac{1}{800}$, $\frac{1}{400}$, $\frac{2}{300}$, $\frac{1}{700}$.

Read as fractions in lowest terms:

7. $14\frac{2}{7}\%$, 20%, 25%, $66\frac{2}{3}\%$, $37\frac{1}{2}\%$, $83\frac{1}{3}\%$, 75%, 65%, $33\frac{1}{3}\%$, $11\frac{1}{9}\%$.

8. $12\frac{1}{2}\%$, $8\frac{1}{3}\%$, $9\frac{1}{11}\%$, $16\frac{2}{3}\%$, $6\frac{1}{4}\%$, $6\frac{2}{3}\%$, $87\frac{1}{2}\%$, $62\frac{1}{2}\%$, 3%, $\frac{1}{2}\%$.

9. 45%, 30%, 55%, $\frac{1}{10}\%$, .5%, .25%, $\frac{7}{8}\%$.

Read as per cent:

10. $\frac{3}{4}$, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{3}{5}$, $\frac{1}{6}$, $\frac{5}{6}$, $\frac{7}{8}$, $\frac{3}{8}$, $\frac{1}{12}$, $\frac{5}{8}$, $\frac{1}{8}$, $\frac{1}{9}$, $\frac{1}{11}$, $\frac{1}{7}$, $\frac{1}{15}$, $\frac{1}{16}$, $\frac{1}{3}$, $\frac{2}{3}$, $\frac{1}{10}$, $\frac{1}{20}$, $\frac{1}{25}$.

11. $\frac{1}{50}$, $\frac{9}{10}$, $\frac{1}{40}$, $\frac{1}{80}$, $\frac{1}{30}$, $\frac{1}{60}$, $\frac{3}{40}$, $\frac{7}{30}$, $\frac{1}{150}$, $\frac{1}{1000}$, $\frac{1}{500}$, $\frac{1}{200}$, $\frac{7}{800}$, $\frac{1}{300}$, $\frac{3}{400}$, $\frac{5}{600}$.

12. .5, .25, .75, .6, .12, $.6\frac{1}{2}$, .35, .01, 1.2, $1\frac{3}{4}$, $2\frac{1}{2}$, 1.5, $1\frac{7}{8}$, .375.

13. .625, .125, .875, .005, .0625, $.1111\frac{1}{9}$, $.0909\frac{1}{11}$, $4444\frac{4}{9}$, .01125, .015.

14. .0125, .0175, .001, .0025.

204

1. 5 is what part of 15? What per cent? Of 20? 25? 35? 50?

2. 10 is what part of 70? What per cent? Of 25? 80? 16? 24?

3. 12 is what part of 96? What per cent? Of 18? 36? 30? 100?

4. 25 is what part of 75? What per cent? Of 30? 45? 60? 72?

5. 30 is what part of 60? What per cent? Of 40? 50? 33? 36?

6. 12 is what per cent of 48? Of 72? 15 of 18? 20 of 24?

7. 5 is what per cent of 55? Of 40? 18 of 20? 33 of 44?
8. 7 is what per cent of 56? Of 63? 20 of 25? 24 of 25?
9. 10 is what per cent of 90? Of 300? 24 of 36? 30 of 75?
10. 3 is what per cent of 300? Of 3000? 5 of 35? 35 of 70?

Note that these are examples in Division. Re-read as such; also the following exercise.

205

1. 7 is $33\frac{1}{3}\%$ of what? 20% of what?
2. 3 is $16\frac{2}{3}\%$ of what? $12\frac{1}{2}\%$ of what?
3. 56 is $87\frac{1}{2}\%$ of what? $66\frac{2}{3}\%$ of what?
4. 25 is $83\frac{1}{3}\%$ of what? 25% of what?
5. 7 is $11\frac{1}{9}\%$ of what? 20% of what?
6. 12 is $66\frac{2}{3}\%$ of what? 50% of what?
7. 15 is 60% of what? 50% of what?
8. 27 is 75% of what? $14\frac{2}{7}\%$ of what?
9. 30 is $62\frac{1}{2}\%$ of what? $83\frac{1}{3}\%$ of what?
10. 32 is 25% of what? $12\frac{1}{2}\%$ of what?

11. 24 is 75% of what?
12. 35 is $83\frac{1}{3}\%$ of what?
13. 35 is $62\frac{1}{2}\%$ of what?
14. 36 is 60% of what?
15. 45 is $55\frac{5}{9}\%$ of what?
16. 49 is $87\frac{1}{2}\%$ of what?
17. 35 is $87\frac{1}{2}\%$ of what?
18. 30 is $37\frac{1}{2}\%$ of what?
19. 12 is $11\frac{1}{9}\%$ of what?
20. 84 is $77\frac{7}{9}\%$ of what?

206

1. What is 50% of $24?
2. What is 25% of $64?
3. What is $33\frac{1}{3}$% of 27 acres?
4. What is $66\frac{2}{3}$% of 36 pounds?
5. What is 75% of 1000 miles?
6. What is $16\frac{2}{3}$% of 30 miles?
7. What is 20% of 50 cents?
8. What is 40% of 75 gallons?
9. What is 80% of 25 days?
10. What is 60% of 15 hours?

Re-read, using fractions instead of %, and the proper sign instead of *of*.

207

12 is what per cent of 24?

$12 = \frac{12}{24} = \frac{1}{2}$ of 24. $\frac{1}{2} = 50\%$. Therefore, 12 is 50% of 24.

1. 30 is what per cent of 75?
2. $750 is what per cent of $1000?
3. 12 yards are what per cent of 36 yds.?
4. 16 cents is what per cent of 24 cents?
5. $20 is what per cent of $25?
6. 2 cents is what per cent of 4 cents?
7. 30 pounds is what part of 50 lbs.?
8. 25 cents is what per cent of $1?
9. 12 acres is what per cent of 30 acres?

Re-read the above as fractions.

208

12 is 50% of what?

$50\% = \frac{1}{2}$. 12 is $\frac{1}{2}$ of 24. Therefore, 12 is 50% of 24.

1. 15 is $33\frac{1}{3}$% of what?
2. $18 is 60% of what?

3. 21 miles is 75% of what?
4. 8 oz. is 80% of how many?
5. 20 is $66\frac{2}{3}\%$ of what?
6. \$42 is 60% of how many dollars?
7. 14 cents is 40% of what?
8. 11 is 20% of what?
9. \$7 is $16\frac{2}{3}\%$ of what?

Re-read the above as fractions.

209

1. A man owned 50 acres of land and sold 10 acres. What per cent of his farm did he sell?

2. John has \$30 in the bank. Marion has $16\frac{2}{3}\%$ as much. How much has Marion?

3. A farmer owned a quarter-section of land and sold 75% of it. How much did he sell?

4. I sold a house for \$4000, which was 80% of the cost. What was the cost?

5. I bought a house for \$4000 and sold it for 80% of the cost. For what did I sell it?

6. A newsboy bought papers at 3 cents apiece and sold them for 5 cents apiece. How much did he gain? What per cent of the cost did he gain?

7. An orchardist planted 75 orange trees and 60% as many lemon trees. How many lemon trees did he plant?

8. In a battle an army lost 6000 men, which was 25% of the number of men engaged. How many men were engaged in the battle?

9. A merchant, whose income is \$2000 per year, saves all but 75% of it. How much does he save?

10. A boy, after spending $66\frac{2}{3}\%$ of his money, has \$3.50 left. How much had he at first?

11. From a bolt of cloth 15 yards have been cut. That which remains is $66\frac{2}{3}\%$ of the entire piece. How many yards in the entire piece?

12. Lynn has \$75 in the bank; Robert has 40% as much, and Robert's money is 60% of Harry's. How much has Harry?

13. A farmer raised 72 bushels of oats, which was 75% of his crop of barley. 50% of his crop of barley was equal to his crop of wheat. How many bushels of wheat did he raise?

14. I sold a cow for \$12 more than she cost, which was a gain of 25% upon the cost. What was the cost?

15. A man traveled 3000 miles last month, which was 60% of what he traveled this month. How much did he travel this month?

16. Maurice spelled 96 words correctly in an examination; Arthur spelled 75% as many, and Harry spelled 75% as many as Arthur. How many did Harry spell?

17. A man paid \$55 for a watch and 20% as much for a chain. What did both cost?

18. 40% of 20 is $16\frac{2}{3}\%$ of what?

19. 75% of 36 is what per cent of 81?

20. What per cent of 48 is $66\frac{2}{3}\%$ of 24?

210

1. A farm sold for \$10,000, which was $62\frac{1}{2}\%$ of what the owner asked for it. What did he ask for it?

2. A house that cost \$1600 was sold for $12\frac{1}{2}\%$ more than it cost. How much was gained?

3. Frank sold his bicycle for $15, which was $37\frac{1}{2}\%$ of what it cost him. What did it cost him?

4. After spending $35 I had $12\frac{1}{2}\%$ of my money left. How much had I at first?

5. A man owned one section of land. He sold $87\frac{1}{2}\%$ of it. How many acres did he sell?

6. $30 is $62\frac{1}{2}\%$ of the cost of a suit of clothes. What is the cost?

7. A merchant marked goods at $2.40 per yard, but was obliged to sell for $87\frac{1}{2}\%$ of the marked price. For what did he sell?

8. A fruit dealer is obliged to sell a certain lot of berries at 5 cents per pound, which is $37\frac{1}{2}\%$ less than cost. What was the cost?

9. Mary has 40 books in her library. Her brother has 64 books. Mary's books are what per cent of her brother's?

10. I have $1000 in the bank. If I draw out $125, what per cent of my money do I draw out?

211

1. $85 was 70% of the price of a ticket to New York. What was the price?

2. 30% of my money will pay half the price of a ticket to Chicago. If I buy the ticket and have $40 left, how much money had I at first?

3. In a box there are 150 oranges. 30% of them are Valencias. How many Valencia oranges were there in the box?

4. An agent collected $21 for me. If I pay him 10% of what he collects, how many dollars do I pay him?

5. A collector collected a certain sum of money. After keeping 10% of it for his work, he paid over to the company for whom he collected it $9000. How much money did he collect?

6. For every $10 a merchant invested in business he receives an income of $9. His income is what per cent of his investment?

7. A man owed a bill of $60. He drew a check for 70% of the amount and paid cash for the rest. How much cash did he pay?

8. 30% of a certain bill is $3.90. What is the bill?

9. After selling 90% of his load, a potato vender had 13 bushels left. How many bushels had he before he sold any?

10. A man sold $37\frac{1}{2}\%$ of a quarter-section of land, which was 30% of all the land he owned. How many acres of land did he own before he sold any?

11. Carl won in a race of 300 rods. This was what per cent of a mile?

12. The number of soldiers killed in a certain battle was equal to $8\frac{1}{3}\%$ of those engaged, who numbered 12,000 men. How many were killed?

13. 84 gallons is $11\frac{1}{9}\%$ of all a certain tank will hold. What will it hold?

14. A certain oil tank holds 882 gallons. When there are 98 gallons in it, what per cent full is it?

15. $9\frac{1}{11}\%$ of the oranges in a box containing 110 oranges were bad. How many were good?

16. What is $18\frac{2}{11}\%$ of 72? Of 720?

17. What is $55\frac{5}{9}\%$ of 45? Of 4.5?

18. In a certain compound are 7 oz. of peppermint, which is $8\frac{1}{3}\%$ of the whole mixture. How much does the whole weigh?

19. If it takes 36,000 ft. of lumber to build a carriage house, and I lack 8000 ft., what per cent of the whole do I lack?

20. Sold a cow for \$7 more than I paid for her, thereby gaining $8\frac{1}{3}\%$. For what did I sell her?

212

(Gain or Loss per cent is reckoned on the cost.)

1. Find gain or loss per cent:

Bought for 2 cents, sold for 3 cents.
Bought for 3 cents, sold for 2 cents.
Bought for 2 cents, sold for 4 cents.
Bought for 4 cents, sold for 2 cents.
Bought for $1\frac{1}{2}$ cents, sold for 2 cents.
Bought for \$50, sold for \$75.
Bought for \$15, sold for \$16.
Bought for \$1000, sold for \$1125.
Bought for \$1500, sold for \$1575.

2. Find gain or loss:

Cost:

\$25, 20% gain = \$? gain.
150, 10% loss.
72, $11\frac{1}{9}\%$ loss.
35, $14\frac{2}{7}\%$ gain.
42, $16\frac{2}{3}\%$ gain.

3. Find gain or loss.

Cost:

5 cents, 80% gain = ? cents gain.
15 cents, $6\frac{2}{3}\%$ gain.
$1.00, 10% loss.
$1.25, 4% loss.
$1000, $\frac{1}{2}\%$ loss.

4. Find cost:

Gain, $50, or 50%.
Gain, $7, or $12\frac{1}{2}\%$.
Gain, $3, or 4%.
Loss, $100, or $16\frac{2}{3}\%$.
Loss, $1, or $\frac{1}{2}\%$.
Gain, 5 cents, or $33\frac{1}{3}\%$.
Gain, $1\frac{1}{2}$ cents, or 75%.
Loss, $2, or 100%.
Gain, $56, or $87\frac{1}{2}\%$.
Loss, $12, or $\frac{3}{8}\%$.

5. Find selling price in Nos. 2, 3, and 4.

6. Find cost:

Selling price, 125%; gain, $10.
Selling price, $116\frac{2}{3}\%$; gain 50 cents.
Selling price, $114\frac{2}{7}\%$; gain, $6.
Selling price, 90%; loss, 20 cents.
Selling price, 75%; loss, $300.
Selling price, $137\frac{1}{2}\%$; gain, $24.
Selling price, 102%; gain, $5.
Selling price, 98%; loss, $5.
Selling price, 95%; loss, $1.
Selling price, $101\frac{1}{2}\%$; gain, $1.50.

7. Find cost:

Selling price, \$.40; gain, $33\frac{1}{3}\%$.
Selling price, \$35; gain, $16\frac{2}{3}\%$.
Selling price, \$120; loss, 20%.
Selling price, 24 cents; loss, $14\frac{2}{7}\%$.
Selling price, 3 cents; gain, 50%.
Selling price, \$110; gain, 10%.
Selling price, 59 cents; gain, 18%.
Selling price, 55 cents; loss, $16\frac{2}{3}\%$.
Selling price, 99 cents; loss, 1%.
Selling price, 5 cents; gain, 100%.

8. Buying at the rate of 5 for 3 cents and selling at the rate of 3 for 6 cents will give what per cent gain?

9. If selling at $62\frac{1}{2}$ cents gives a loss of $16\frac{2}{3}\%$, would a selling price of 80 cents have given a gain or loss, and what per cent?

10. If a half-cent gain is $33\frac{1}{3}\%$ gain, what per cent gain would one-third cent have been?

213

1. If an agent charges 2% commission for investing money, what is his commission for buying \$100 worth of goods? What do the \$100 worth of goods really cost the man for whom they are bought?

2. An agent sells \$500 worth of goods on a commission of 1%. What does his commission amount to? What does the owner of the goods receive?

3. Find commission:

Cost of goods, $1000; rate of commission, 1%.
Cost of goods, $124; rate of commission, 2%.
Cost of goods, $250; rate of commission, $1\frac{1}{2}$%.
Cost of goods, 17 cents; rate of commission, 3%.
Cost of goods, $4000; rate of commission, 25%.

4. Find the whole cost in each above case.

5. Find commission:

Selling price, $50; rate of commission, $2\frac{1}{2}$%.
Selling price, $37\frac{1}{2}$¢; rate of commission, $33\frac{1}{3}$%.
Selling price, $1500; rate of commission, 5%.
Selling price, $10,000; rate of commission, $3\frac{1}{5}$%.
Selling price, $72.25; rate of commission, 2%.

6. Find proceeds in each case in No. 5. [*Proceeds*, what is left of selling price after commission is taken out.]

7. Find commission:

Money collected, $25; rate of commission, 1%.
Money collected, $800; rate of commission, $12\frac{1}{2}$%.
Money collected, $625; rate of commission, 10%.
Money collected, $500; rate of commission, 20%.
Money collected, $15; rate of commission, 15%.

8. Find proceeds in each case above.

9. Find rate of commission:

Money collected, $1000; commission, $10.
Money collected, $250; commission, $25.
Money invested, $5400; commission, $27.
Money invested, $22.50; commission, $2.50.

Selling price, $20; commission, $1.00.
Selling price, 16¢; commission, 1¢.
Selling price, $3.50; commission, $.50.
Money collected, $1890; commission, $2.10.
Money collected, $25; commission, 25¢.
Money invested, $750; commission, $5.

10. Commission at 2% was $10. Find money collected.
Commission at 20% was $2.50. Find money collected.
Commission at $11\frac{1}{9}$% was $50. Find money collected.
Commission at $\frac{1}{2}$% was $3. Find selling price.
Commission at $6\frac{2}{3}$% was $25. Find selling price.
Commission at $6\frac{1}{4}$% was $400. Find selling price.
Commission at $8\frac{1}{3}$%, $7. Find cost.
Commission at 1%, $17.25. Find cost.
Commission at $\frac{3}{4}$%, $100. Find cost.
Commission at 35%, $35. Find cost.

11. Whole cost, including commission, was $52.50. The commission was $2.50. What was the rate?

12. Whole cost, including $5.25 commission, was $180.25. What was the rate of commission?

13. Whole cost, including $150 commission, was $5150. What was the rate of commission?

14. Whole cost, including 20¢ commission, was $80.20. What was the rate of commission?

15. Whole cost, including $8 commission, was $80. What was the rate of commission?

16. Whole cost, including 1% commission, was $101. What was the cost of goods? The commission?

17. Whole cost, including 25% commission, was $312\frac{1}{2}$. What was the cost of the goods? Commission?

18. Whole cost, including $\frac{1}{2}$% commission, was $1005. Find cost of goods and the commission.

19. Whole cost of goods and commission was $1262.50. Find cost of each if the commission was 1%.

20. What was the commission at 3% on goods whose whole cost was $108.15?

21. Remittance, $4160; commission, 4%. Find amount invested in goods. [*Remittance*, money sent to agent.]

22. Remittance, $151.50; commission, 1%. Find cost of goods.

23. Remittance, $201; commission, $\frac{1}{2}$%. Find cost.

24. Proceeds from a sale were $99; commission was $1. What was the selling price?

25. Proceeds, $140; commission, $10. Find rate of commission.

Proceeds, 15¢; commission, 1¢. Find rate of commission.

Proceeds, $29; commission, $1. Find rate of commission.

Proceeds, $49; commission, $1. Find rate of commission.

Proceeds, $100; commission, $50. Find rate of commission.

26. Proceeds, $75; commission, 25%. Find selling price and commission.

Proceeds, $80; commission, $6\frac{1}{4}$%. Find selling price and commission.

Proceeds, $297; commission, 1%. Find selling price and commission.

Proceeds, $1000; commission, $9\frac{1}{11}$%. Find selling price and commission.

Proceeds, 11¢; commission, $8\frac{1}{3}$%. Find selling price and commission.

27. Selling price, $550; proceeds, $500. Find rate of commission.

Selling price, $480; proceeds, $450. Find rate of commission.

Money collected, $30; proceeds, $27. Find rate of commission.

Money collected, $10,000; proceeds, $8750. Find rate of commission.

Money collected, $960; proceeds, $864. Find rate of commission.

28. Proceeds, 80%; commission, $7. Find selling price.

Proceeds, $87\frac{1}{2}\%$; commission, $14. Find selling price.

Proceeds, 99%; commission, $50. Find selling price.

Proceeds, $99\frac{1}{2}\%$; commission, $3. Find selling price.

Proceeds, 95%; commission, $100. Find selling price.

214

1. How much money must I send my agent so that he can buy $918 worth of goods, if he charges 2% commission?

2. If I send my agent, who charges 2% commission, $918 with which to buy goods, how many dollars' worth of goods can he buy?

3. My agent sends me $450 as my proceeds from the sale of goods. If he charges 10% commission, what was the selling price?

4. At another time my agent sends me $630 as my proceeds of a sale amounting to $700. What was his per cent commission?

5. If an agent's commission for collecting $200 is $5, what is his rate of commission?

6. The selling price of a mine was $100,000. What was the agent's commission at 3%?

7. The rate of commission allowed for selling a certain tract of land was $1\frac{1}{2}\%$. What was the selling price if the commission amounted to $3000?

8. A commission merchant sells oranges at $2 per box on a commission of 1%. How many boxes must he sell to make $50?

9. A book agent receives $1.25 for selling a $5 book. What is the rate of commission?

10. After retaining his commission of 5%, an agent sends $475 to the firm for whom he is selling books. How many volumes has he sold if the books sell at $5?

215

1. When the duty on glass is 40 cents per pound, what will it cost to import 400 pounds?

2. What is the duty on 500 gallons imported olives at 2 cents per quart?

3. A tobacconist imported 1000 lbs. cigars, paying a duty of $4.50 per pound. What was the cost of importing?

4. A merchant paid $330 import duty on handkerchiefs at 55% ad valorem. What was the cost of the goods and duty? [*Ad valorem*, according to value.]

5. What is the duty on a bolt of cotton cloth 48 in. wide, 60 yd. in the bolt, at $2\frac{1}{2}$¢ per square yard?

6. What is the duty on plate glass for a window 10 ft. square at 11¢ per square foot?

7. A dealer in firearms imported $500 worth of muskets at a duty of 25% ad valorem. What was the duty?

8. What is the cost of importing 600 sq. yd. Oriental carpet at a duty of 10¢ per square yard and 40% ad valorem?

9. An importer paid a specific duty of $30 on 1000 lb. coffee. What was the duty per pound? [*Specific*, according to weight or measure.]

10. It cost $1000 to import a certain bill of firecrackers at 8¢ per pound? How many pounds were imported?

11. Cotton-seed oil is charged an import duty of 4¢ per gallon. What will it cost to import 100 bbl.?

12. I paid $180 ad valorem duty on $400 worth of opera glasses. What was the rate?

13. A stationer imported 100 great gross pens at a duty of 12¢ per gross. What was the entire duty?

14. A dealer imported 4800 lb. barley and 1120 lb. corn. He paid a duty of 30¢ per bushel of 48 lb. on the barley, and of 15¢ per bushel of 56 lb. on the corn. What was the entire duty?

15. It costs $2\frac{1}{2}$¢ per pound to import chocolate. A man who paid a duty of $100 imported how many pounds?

16. A wine merchant imported 1500 doz. bottles of wine, paying a duty of $6000. What was the duty per dozen?

17. It costs 50¢ per pound to import peppermint oil. How much will cost $75.50?

216

1. If it costs me $4.50 to insure my household goods for $1500 for one year, what is the rate of premium?

2. I value my property at $5000. An insurance company will insure it for 80% of its value, at 2% per annum. What will the insurance cost me in 5 years?

3. The Equitable Life Insurance Company charges me $3\frac{2}{5}\%$ for a policy of $2000. What is my yearly premium?

4. A man had his life insured, when he was twenty-five years old, for $5000, paying at the rate of $16.50 on a thousand yearly. What did his premium amount to at thirty-five?

5. A merchant insured his stock for $12,250 at 3%. What did it cost him?

6. A ship's cargo was insured for $7000. In a storm $\frac{3}{4}$ of the cargo was lost. What insurance should the owner receive?

7. An accident insurance company charged $50 for a $2000 policy. What was the rate charged?

8. The contents of a warehouse were insured at $3\frac{1}{3}\%$. What was the insurance valuation if the premium amounted to $240?

9. Insuring my house for $\frac{3}{4}$ of its value cost me $120 at 3% premium. What is the value of the house?

10. What will it cost a jeweler to insure his stock for $290,000 at $1\frac{1}{2}\%$ premium?

217

1. The tax in a certain town is 20 cents on $100. What is the rate of taxation?

What is the rate when the tax is:

2. 5 mills on a dollar? 15¢ on $100? 28¢ on $100?

3. 18¢ on $100? 3 mills on $1.00? 4 mills on $1.00?

4. 7 mills on $1.00? 14 cents on $100? 22¢ on $100?

5. How many cents on $100 is a tax of:

$\frac{3}{8}\%$? $\frac{1}{5}\%$? $\frac{2}{7}\%$? $\frac{2}{9}\%$? $\frac{3}{10}\%$? $\frac{13}{50}\%$? $\frac{9}{20}\%$? $\frac{5}{12}\%$? $\frac{3}{11}\%$? $\frac{1}{30}\%$?

[$\frac{3}{8}\% = \frac{3}{800}$. $\frac{3}{800}$ of $100 = \$\frac{3}{8} = 37\frac{1}{2}$ cents.]

6. How many mills on a dollar is each of the above rates?

[$\frac{2}{7}\% = \frac{2}{700}$. $\frac{2}{700}$ of $100¢ = \frac{2}{7}¢$. $\frac{2}{7}$ of 10 mills $= \frac{20}{7}$ mills $= 2\frac{6}{7}$ mills, $\$.002\frac{6}{7}$.]

7. When the rate of taxation is $\$.002\frac{1}{2}$ on $1, what tax does a man who owns $2000 worth of property pay?

8. When the rate is 25 cents on $100, what does a man who owns $10,000 worth of property pay?

9. When the rate is 24 cents on a dollar, what is a man's tax on $500?

10. A tax of $5000 is levied on the property in a certain county. What is the rate if the property is valued at $1,000,000?

11. What is the value of the property in a town upon which a tax of $1500 is raised at 20¢ on $100?

12. A certain street tax for grading, paving, curbing, and side-walking is $4 per front foot. What does a man pay on a lot 75 ft. wide?

218

1. When par value is $100, what is the market value of stock selling at:

10% premium?	$37\frac{1}{2}\%$ premium?	$12\frac{1}{2}\%$ discount?
1% premium?	28% premium?	25% discount?
25% premium?	140% premium?	40% discount?
$33\frac{1}{3}\%$ premium?	10% discount?	$\frac{3}{4}\%$ discount?
$12\frac{1}{2}\%$ premium?	1% discount?	20% discount?
100% premium?	$33\frac{1}{3}\%$ discount?	11% discount?
75% premium?	$1\frac{1}{2}\%$ discount?	

2. When par value is $100, what is the market value of stock quoted at :

$88\frac{8}{9}$?	79?	$56\frac{1}{2}$?	99?	$66\frac{2}{3}$?
$87\frac{1}{2}$?	84?	112?	95?	150?
$103\frac{1}{2}$?	68?	$62\frac{1}{2}$?	90?	190?
159?	20?	240?	50?	175?

3. Which of the above are at a premium?

4. At a par value of $100, what is the amount of money received upon one share when the company declares a dividend of :

6%? 4%? $3\frac{1}{2}$%? 10%? 5%? 2%? 3%? $5\frac{1}{2}$%? 1%? $\frac{2}{3}$%?

5. At a par value of $100, what dividend has been declared when a stockholder receives on each share :

$1.00? $1.25? $2.50? $5.00? $1\frac{1}{3}$? $2\frac{1}{4}$? $3\frac{1}{2}$? $1\frac{3}{4}$?

6. A man bought stock at 25% premium. What interest on his investment does a $1.25 dividend pay?

7. A man bought stock at 98. What interest on his investment does a dividend of $1.96 pay?

8. A man bought stock at 20% discount. When a 5% dividend is declared, what rate of interest on his investment does he receive?

9. I bought stock at par. It paid 2% on my investment. What dividend was declared?

10. I bought stock, par value $100, at $50. The first dividend paid 10% on my investment. What per cent dividend had been declared?

11. I bought stock, par value $100, at 105. It paid $\frac{1}{2}$% interest on my money What dividend was that?

12. I bought stock at par value, $100. How much had I to pay on 100 shares when an assessment of 1% was levied?

13. I bought stock, par value $100, at 75. An assessment of 3% was levied. What had 50 shares cost me when I had paid this assessment?

[Unless otherwise stated, par value is always understood to be $100.]

[Assessments are levied on, and dividends declared on, Par Value.]

14. When a $2\frac{1}{2}\%$ dividend is declared, how much should I receive on 1000 shares?

15. When a 1% assessment is levied, how much must the owner of 500 shares pay?

16. When a 4% dividend was declared a certain stockholder received $100. How many shares did he own? How much had the shares cost him if he bought them at 80?

17. What per cent on his investment did above income pay?

18. A broker bought stock at 88 and sold at 100. What did he make on 75 shares?

19. A broker bought stock at 112 and sold at 99. What did he lose on 30 shares?

20. A broker bought stock at 75 and sold at such a price that he made $500 on 100 shares. At what price did he sell?

219

1. What is 1% of each of the following amounts:

$100? $2000? $1500? $1740? $500? $3000? $2700? $3270? $600? $4000? $2400? $1720? $800? $7000? $3500? $5280? $900? $10,000? $3600? $8240?

2. What is 2% of each of the above?

3. What is $\frac{1}{2}$% of each of the above?

4. On May 1 I hired $100. On April 1 I paid it back, and beside, 1% of the sum for its use. How much did I pay?

5. What should I pay at $\frac{1}{2}$% a month for the use of $500 for two months?

6. If I borrow $600 for 3 months at 1% per month, how much must I pay when I pay the debt?

7. What name is given to the sum of money paid for the use of money?

8. What is the interest on $800 for 4 months at $\frac{1}{2}$% per month?

9. What is the interest on $900 for 1 year at 6% per year? For 6 months?

10. What is the interest on $2000 for 1 year and 6 months at 6% per year?

11. What is the interest on:

$3000 for 2 yr. at 6% per year?
$4000 for 1 yr. 9 mo. at 6% per year?
$2500 for 1 yr. 3 mo. at 6% per year?
$1500 for 1 yr. 1 mo. at 6% per year?
$5000 for 5 yr. at 6% per year?

12. What is the amount to be paid in each case above when the debt is paid?

13. A man borrowed $1000 on Jan. 1, 1900, at 10% per year. What is the amount of the debt due on Nov. 1, 1901?

14. Find interest on:

$1200 for 9 mo. at 10%. $1725 for 1 yr. at 5%.

15. I paid \$72 for the use of \$1200 for 1 year. What was the rate of interest charged?

16. I paid \$100 for the use of \$1000 for 2 years. Find rate of interest.

17. The interest on \$1500 for $1\frac{1}{2}$ years was \$120. What was the rate?

18. The interest on \$2000 for 3 years was \$480. What was the rate?

19. I paid \$3.60 for the use of \$60 for 6 months. What was the rate?

20. I borrowed \$100 for 1 year. At the end of the year it amounted to \$112. What interest did I pay?

21. At what rate will \$75 amount to \$100 in 5 years?

22. \$500 will amount to \$560 at what rate in 2 years?

23. \$124 in 1 year and 6 months amounted to \$133.30. What was the rate?

24. \$1000 will amount to \$1024 in 3 years at what per cent?

25. I hired a certain sum of money at 6% for 1 year. The interest amounted to \$6. What was the sum of money hired?

26. The interest on a certain sum of money for 2 years at 6% was \$15. What was the sum of money?

27. I paid \$21 for the use of a certain sum of money for 1 yr. 9 mo. at 6%. What was the sum?

28. What sum of money will earn \$75 in 3 yr. at 5%?

29. \$42 is the interest on what sum of money for 2 years at 7%?

30. \$60 is the interest for 6 months at 8% on what sum of money?

31. How many dollars will amount to $106 in 1 year at 6%?

32. How many dollars will amount to $275 in 2 years at 5%?

33. What sum will amount to $1024 in 3 years at 8%?

34. I hired a certain sum of money for 2 yr. at 7%. When I paid it, it amounted to $128. What was the sum hired?

35. What sum of money will amount to $336 in 1 year 4 months at 9%?

36. I hired $1000 and kept it until it amounted to $1050 at 5%. How long did I keep it?

37. A man hired $200 for so long a time that it amounted to $300 at 10%. How long did he keep it?

38. In what time will $150 earn $2.50 at 5%?

39. How long will it take $250 to earn $10 at 6%?

40. How long will it take $425 to amount to $467.50 at 10%?

220

1. Find the interest on $400 for 1 yr. 9 mo. 24 da. at 6%.
2. Find interest on $250 for 2 yr. 6 mo. 6 da. at 10%.
3. Find interest on $45 for 3 mo. 10 da. at 5%.
4. Find interest on $90 for 9 mo. 15 da. at 6%.
5. Find interest on $1000 for 2 yr. 20 da. at 6%.
6. Find interest on $500 for 63 da. at 6%.
7. Find interest on $50 for 7 mo. at 8%.
8. Find interest on $100 for 5 mo. 5 da. at 6%.
9. Find interest on $120 for 1 yr. 7 mo. at 7%.
10. Find amount in each case above.

221

1. At what rate will \$60 earn \$18 in 3 yr.?
2. At what rate will \$800 amount to \$950 in 1 yr. 6 mo.?
3. In what time will \$75 earn \$1 at 1% per month?
4. In what time will \$100 amount to \$150 at 6%?
5. What sum will earn \$50 per month at 4% per year?
6. What sum will amount to \$1150 in 5 yr. at 3%?
7. In what time will \$4000 earn \$100 at 6%?
8. What sum will earn \$75 in 4 mo. at 8%?
9. What is the amount of \$1 for 1 yr. 1 mo. at 6%?

222

Find the number of days on the calendar from:

1. Mar. 3 to Sept. 7.
2. Jan. 15 to Aug. 13.
3. June 11 to Dec. 7.
4. Nov. 3 to Feb. 10.
5. Aug. 9 to Jan. 9.
6. Dec. 20 to May 10.
7. Oct. 8 to Dec. 3.
8. Feb. 3 to Nov. 13.
9. Nov. 13 to Feb. 3.
10. Aug. 16 to Mar. 24.

223

\$41.00. Los Angeles, April 3, 1904.

Six months after date I promise to pay to Ernest Davids, the sum of Forty-one Dollars, with interest at 6% per annum, for value received. Robert McGovern.

1. Who promises to pay the money?
2. What is this written promise to pay called?

3. To whom does he promise to pay?

4. What is the one to whom the note is payable called?

5. Can any one else collect the money?

6. Where is it payable?

7. What amount is then due?

8. What is the face of the note?

$100.00. BUFFALO, June 7, 1903.

One year from date I promise to pay to Ray Craig, or order, One hundred Dollars, with interest at 5% per annum, for value received.

HARRY ROSS.

9. Who is the maker or drawer?

10. Who is the payee? The payer?

11. What phrase does it contain that the preceding one does not?

12. What difference does this make?

13. What is the date? The face?

14. What is the date of maturity?

15. What is then due?

Read the above note, changing the place, date, face, and interest, and making John Gordon the drawer and Ralph Lewis payee. Read and write several other notes, making yourself drawer. Tell whether or not the notes are negotiable. [*Negotiable*, transferable.]

PROPORTION

224

$15 \div 3 = 5$. $45 \div 9 = 5$. Therefore, $15 \div 3 = 45 \div 9$.

1. $21 \div 3 = 7$. $56 \div 8 = 7$. Therefore, ?
2. $24 \div 8 = ?$ $27 \div 9 = ?$ Therefore, ?
3. $28 \div 7 = ?$ $44 \div 11 = ?$ Therefore, ?
4. $108 \div 9 = ?$ $132 \div 11 = ?$ Therefore, ?

5. $21 \div 3 = 56 \div ?$
6. $3 \div 15 = ? \div 45$
7. $3 \div 12 = 10 \div ?$
8. $121 \div ? = 88 \div 8$
9. $9 \div 18 = ? \div 14$
10. $7 \div ? = 2 \div 12$
11. $? \div 9 = 36 \div 12$
12. $5 \div ? = 25 \div 5$
13. $10 \div 30 = 7 \div ?$
14. $32 \div 4 = 64 \div ?$
15. $? \div 96 = 2 \div 16$
16. $35 \div ? = 42 \div 6$

$15 \div 3 = 45 \div 9$. Another way of expressing this is 15 : 3 : : 45 : 9. This is read: 15 is to 3 as 45 is to 9.

Read these:

24 : 36 : : 10 : 15 6 : 15 : : 40 : ? 20 : 25 : : ? : 20

7 : 14 : : 5 : ? 18 : 30 : : 60 : ? 45 : 50 : : 18 : ?

12 : ? : : 15 : 45 ? : 21 : : 12 : 18 14 : 24 : : 21 : ?

21 : 42 : : ? : 10 9 : ? : : 12 : 36

Note how : is used in place of $\div$, and : : in place of $=$. This method is called *Proportion*, which is the expression of an equality of *ratios*. *Ratio* means *relation*. The *relation* of 15 to 3 is that of 5 to 1; the *ratio* of 15 to 3 is 5 to 1. The ratio of 45 to 9 is also 5 to 1. Therefore the ratio of 15 to 3 is the same as the ratio of 45 to 9.

The ratio of 3 to 15 is $\frac{1}{5}$; of 9 to 45 is $\frac{1}{5}$. So, 15 : 3 : : 45 : 9 and 3 : 15 : : 9 : 45.

15 : 3 or 3 : 15 is the *first* ratio, while 45 to 9 or 9 to 45 is the *second* ratio.

Suppose the first ratio to be 18 : 6, and the numbers in the second ratio to be 4 and 12. What is the order of the numbers in the second ratio?

1st ratio. Arrange for 2d.

1. 5 : 25 : : (7 and 35)
2. 25 : 5 : : (7 and 35)
3. 42 : 48 : : (63 and 72)
4. 48 : 42 : : (63 and 72)
5. 7 : 8 : : (56 and 64)
6. 8 : 7 : : (56 and 64)
7. 11 : 12 : : (132 and 121)
8. 65 : 5 : : (6 and 78)
9. 96 : 84 : : (35 and 40)
10. 21 : 27 : : (35 and 45)
11. 40 : 30 : : (24 and 32)
12. 100 : 120 : : (10 and 12)

Solve the proportion;

(1) (2) (3) (4)
15 : 3 : : 45 : 9. 15, 3, 45, and 9 are the *first*, *second*, *third*, and *fourth terms*, respectively. The first and fourth terms are called the *extremes;* and the second and third are called the *means*. The product of the means always equals the product of the extremes;

15 : 3 : : 45 : 9. $15 \times 9 = 135$. $3 \times 45 = 135$, hence:

$$15 : 3 : : 45 : ? \text{ is solved, } \frac{3 \times 45}{15} = 9;$$

$$15 : 3 : : ? : 9 \text{ is solved, } \frac{15 \times 9}{3} = 45;$$

$15 : ? : : 45 : 9$ is solved, $\frac{15 \times 9}{45} = 3$;

$? : 3 : : 45 : 9$ is solved, $\frac{3 \times 45}{9} = 15$.

Solve these proportions and those already given:

1.	$18 : 12 : : 15 : ?$	**5.**	$20 : ? : : 35 : 42$	**9.**	$? : 18 : : 30 : 36$
2.	$40 : 70 : : ? : 28$	**6.**	$72 : 60 : : 42 : ?$	**10.**	$54 : ? : : 42 : 35$
3.	$100 : ? : : 50 : 55$	**7.**	$39 : 13 : : ? : 1$	**11.**	$14 : 42 : : ? : 45$
4.	$? : 18 : : 18 : 12$	**8.**	$? : 4 : : 9 : 12$	**12.**	$25 : 60 : : 35 : ?$

Mary bought 3 pounds of candy for 45 cents. I bought 5 pounds of the same candy. What should I pay?

The same relation that exists between the weight of her candy and mine should exist between the *price* of hers and of mine. I bought more candy and must pay more than she, therefore: $3 : 5 : : 45 : ?$

Before stating the first ratio, you must always ask yourself the question, Is the answer to be greater or smaller than the corresponding given number? Then arrange both ratios in accordance with this reasoning.

1. If 20 marbles cost 30 cents, what will 30 of the same kind cost?

2. If 5 pounds of candy cost 75 cents, what will 12 pounds cost?

3. If 2 yards of ribbon cost 25 cents, what will 6 yards cost?

4. If 8 yards of ribbon cost 56 cents, what will 3 yards cost?

5. If 10 cows cost $600, what will 7 cows cost?

If 7 pounds of peaches cost 105 cents, how many pounds can be bought for 85 cents?

105 cents is to 85 cents as the amount 105 cents will buy is to the amount 85 cents will buy. Therefore, 105 : 85 : : 7 : ?

1. If 25 yards of carpet cost $30, how many yards can be bought for $50?

2. If the railroad fare for 500 miles is $24, $40 will pay fare for how many miles?

3. If it cost $37 to carry a certain amount of freight 50 miles, how many miles should $60 carry it?

4. If it cost $28 to transport 50 tons of freight a certain distance, how many tons should $75 transport the same distance?

5. If it cost $40 to build 15 rods of fence, how many rods of the same fence cost $25?

---

1. If 11 men can pick 30 boxes of fruit in an hour, how many boxes can 20 men pick in the same time?

2. If 5 men dig 40 ft. of ditch, how many feet should 7 men dig in the same time?

3. If 3 boys dry 25 boxes of apricots a day, how many boxes ought 10 boys to dry in the same time?

4. If 9 men use 6 loaves of bread a day, how many loaves would 5 men use?

5. If 2 men cut 15 cords of wood in a week, how many cords should 3 men cut?

6. If 5 men cut 16 cords of wood in a week, how many men would be required to cut 20 cords?

7. If 8 bales of hay last 5 horses a month, how long should 10 bales last?

8. If 12 men dig 30 ft. of ditch in a certain time, how many men would be required to dig 45 ft. in the same time?

9. If 8 persons weigh 1000 pounds, how many persons of the same average weight would weigh 750 pounds?

10. If 10 girls make 25 yards of lace in a given time, how many girls should make 75 yards in the same time?

---

1. A certain flagpole casts a shadow 40 ft. long at the same time a stake 3 ft. high casts a shadow 4 ft. long. How high is the pole?

2. A church steeple that casts a shadow 60 ft. long at the same time a 6 foot pole casts a shadow 5 ft. long is how high?

3. How tall is a tree casting a shadow 240 ft. long, when a tree 12 ft. tall casts a shadow 15 ft. long?

4. How long a shadow does a man 6 ft. tall cast, when a child $2\frac{1}{2}$ ft. tall casts a shadow 3 ft. long?

5. At a certain time of day our house casts a shadow across the street, which is 60 ft. wide. At the same time my shadow is 6 ft. long, while I am only 5 ft. tall. How high is our house?

---

1. If it takes 4 men 12 days to do a certain piece of work, how long should it take 5 men to do it?

2. If 20 men require 11 days to build a certain wall, in what time should 15 men build it?

3. If 3 men do certain work in 8 days, how many men would be required to do it in 6 days?

4. Ten men did certain work in 24 days. How many would have been required to do it in 30 days?

5. If 18 men can do a certain piece of work in 5 days, how many additional men would be required to do it in 3 days?

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